US009986107B2

(12) **United States Patent**
Kurumasa et al.

(10) **Patent No.: US 9,986,107 B2**
(45) **Date of Patent: May 29, 2018**

(54) **SYSTEMS AND METHODS FOR DISPLAYING REMOTE OPERATION SCREENS OF AN IMAGE FORMING APPARATUS BASED ON A CONFIGURATION OF DISPLAY(S) OF A MOBILE TERMINAL**

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(73) Assignee: **Konica Minolta, Inc.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days. days.

(21) Appl. No.: **15/051,099**

(22) Filed: **Feb. 23, 2016**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Feb. 24, 2015 (JP) 2015-034431

(51) **Int. Cl.**

G06F 3/12	(2006.01)
H04N 1/00	(2006.01)
H04N 1/327	(2006.01)

(52) **U.S. Cl.**

CPC ***H04N 1/00209*** (2013.01); ***H04N 1/00204*** (2013.01); ***H04N 1/00307*** (2013.01); ***H04N 1/00411*** (2013.01); ***H04N 1/00472*** (2013.01); ***H04N 1/00973*** (2013.01); ***H04N 1/32767*** (2013.01); *H04N 2201/0094* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2006/0290680	A1*	12/2006	Tanaka	H04N 1/00204 345/173
2012/0293823	A1*	11/2012	Gribel	G06F 3/1205 358/1.13
2014/0146358	A1*	5/2014	Morita	H04N 1/00352 358/1.15

FOREIGN PATENT DOCUMENTS

JP	2014-107800	A	6/2014

* cited by examiner

Primary Examiner — Henok A Shiferaw

(74) *Attorney, Agent, or Firm* — Baker & Hostetler LLP

(57) **ABSTRACT**

An image forming apparatus capable of being remotely operated by a mobile terminal includes: a specification unit configured to specify an image to be displayed on the mobile terminal as an operation image for the image forming apparatus; an acquisition unit configured to acquire information on the number of display units of the mobile terminal; a decision unit configured to, when a plurality of images is specified as the operation images and the number of the display units of the mobile terminal is recognized as two or more, make a first decision that at least two of the plurality of images are to be displayed on at least two of the two or more display units of the mobile terminal; and a transmission unit configured to transmit a display instruction based on the first decision to the mobile terminal.

20 Claims, 29 Drawing Sheets

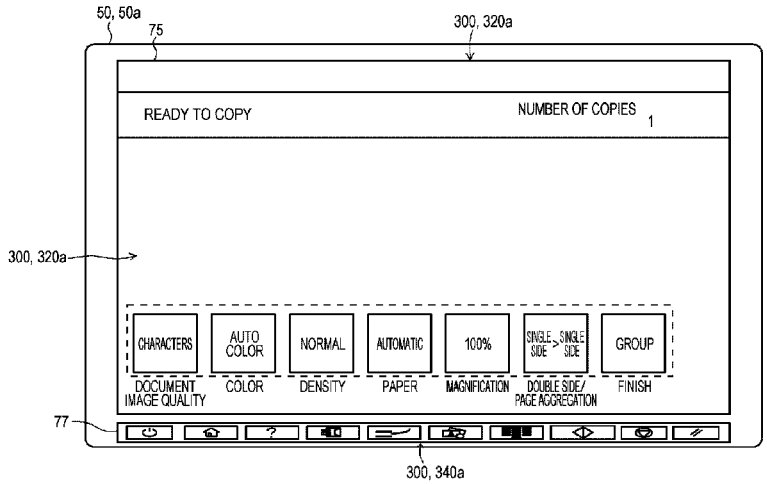


FIG. 1

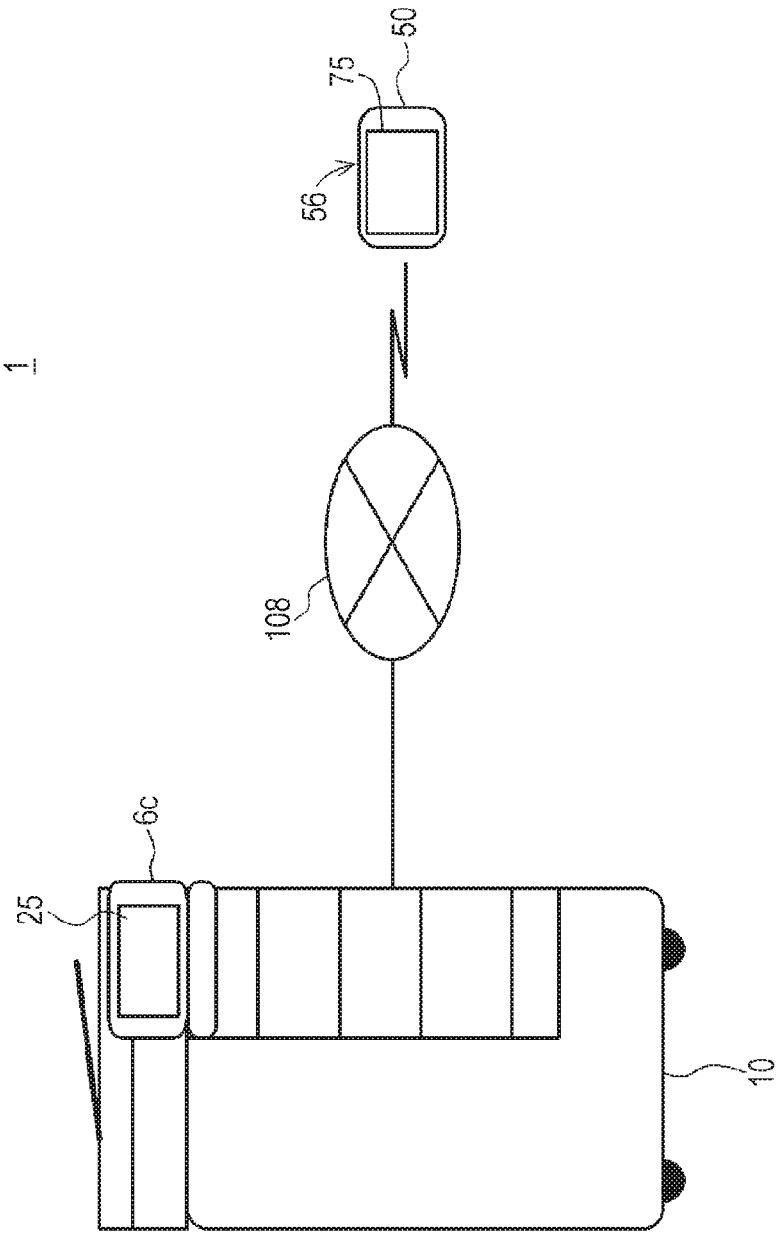


FIG. 2

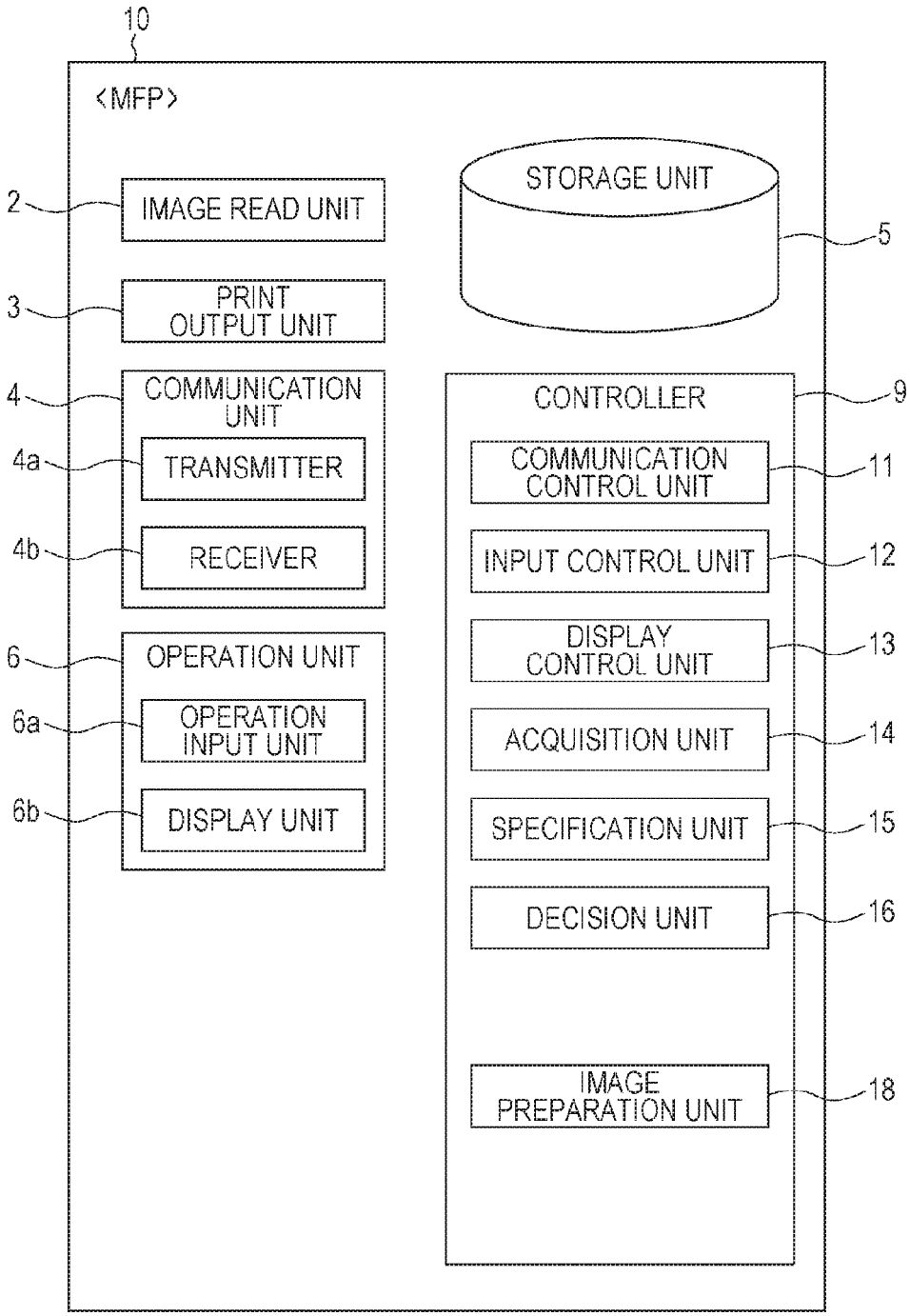

10
<MFP>
2
IMAGE READ UNIT
3
PRINT OUTPUT UNIT
4
COMMUNICATION UNIT
4a
TRANSMITTER
4b
RECEIVER
6
OPERATION UNIT
6a
OPERATION INPUT UNIT
6b
DISPLAY UNIT
STORAGE UNIT
5
CONTROLLER
9
COMMUNICATION CONTROL UNIT
11
INPUT CONTROL UNIT
12
DISPLAY CONTROL UNIT
13
ACQUISITION UNIT
14
SPECIFICATION UNIT
15
DECISION UNIT
16
IMAGE PREPARATION UNIT
18

FIG. 3

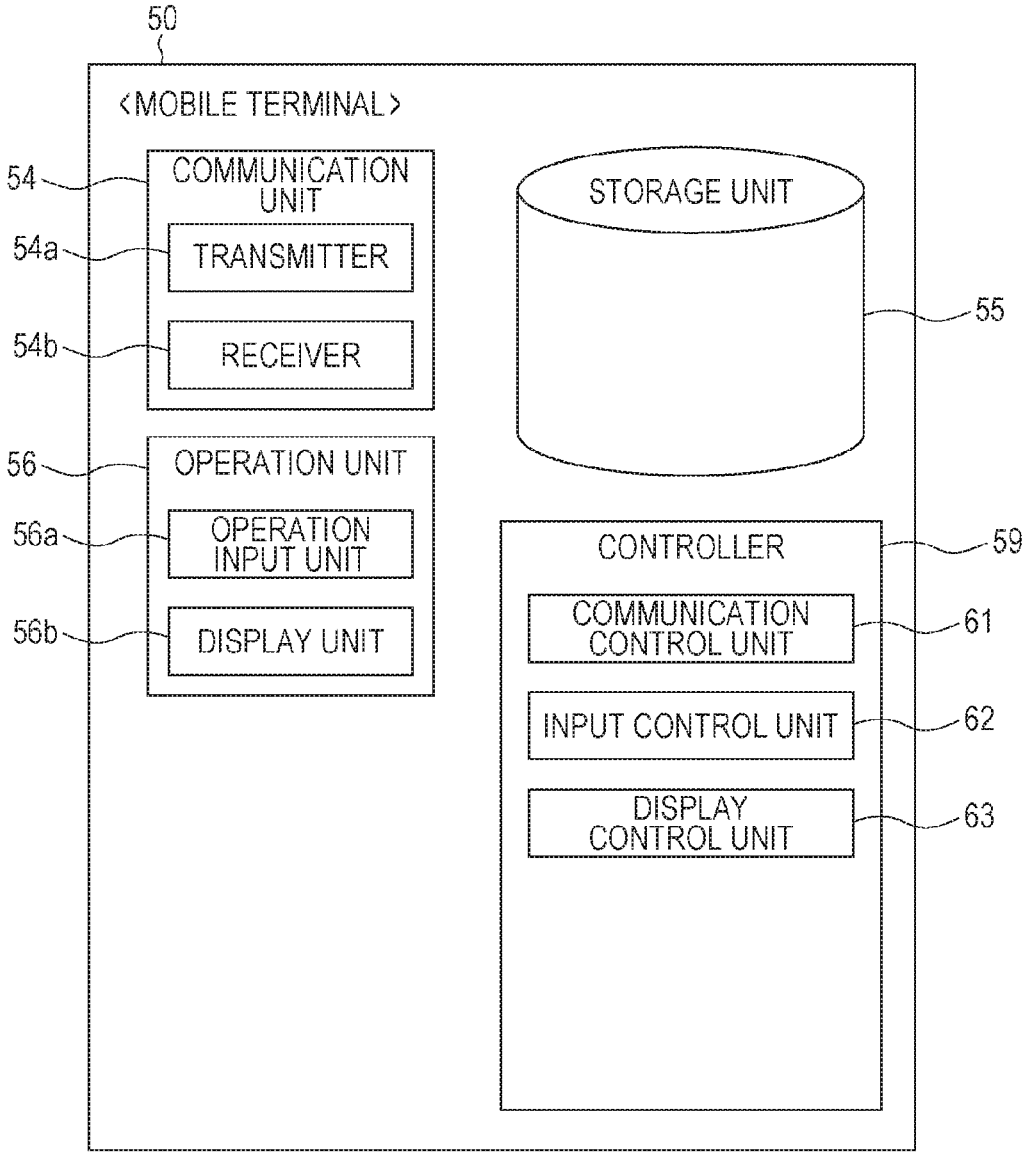

50
<MOBILE TERMINAL>
54
COMMUNICATION UNIT
54a
TRANSMITTER
54b
RECEIVER
56
OPERATION UNIT
56a
OPERATION INPUT UNIT
56b
DISPLAY UNIT
STORAGE UNIT
55
CONTROLLER
59
COMMUNICATION CONTROL UNIT
61
INPUT CONTROL UNIT
62
DISPLAY CONTROL UNIT
63

FIG. 4

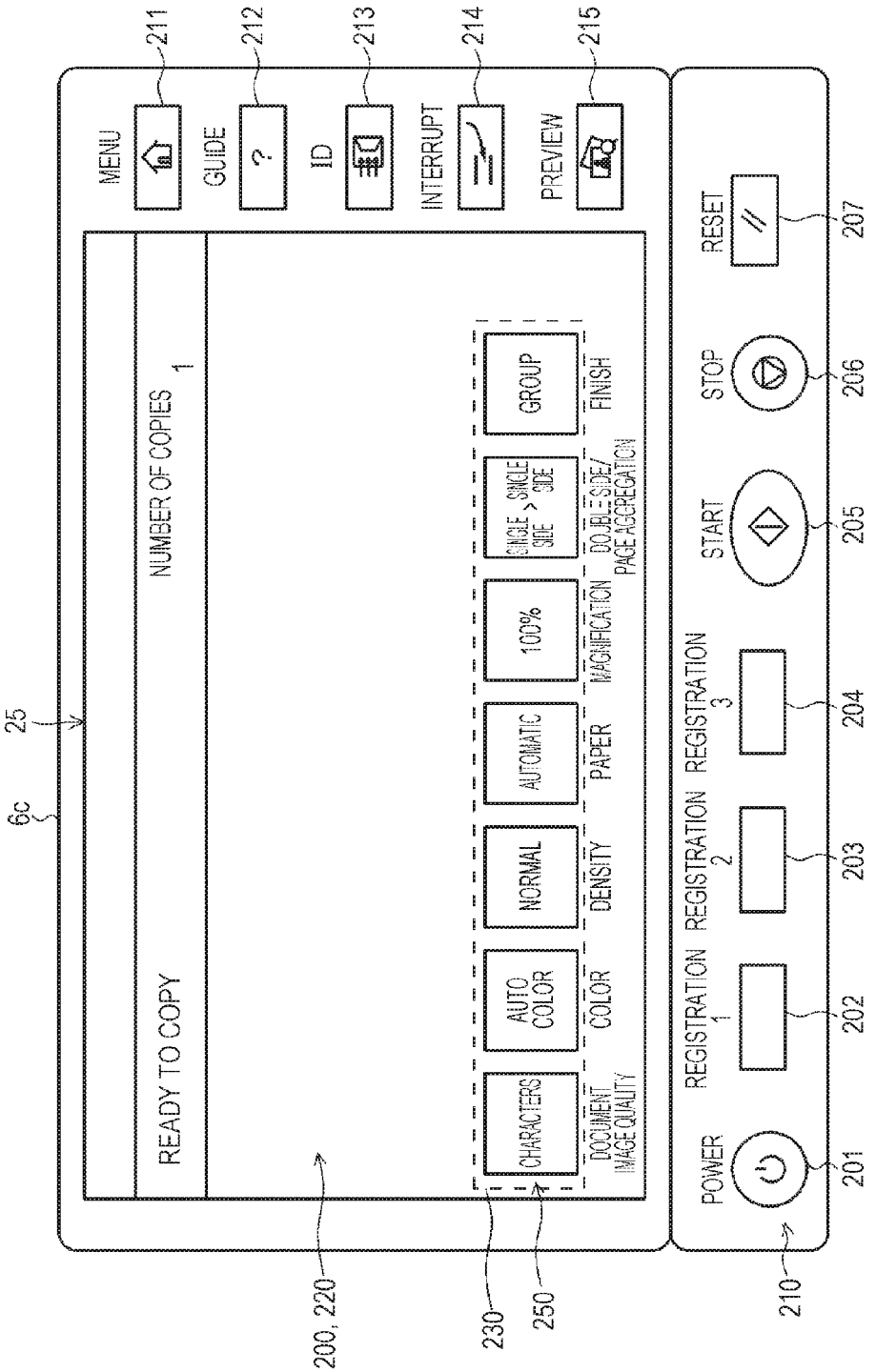

MENU
GUIDE
ID
INTERRUPT
PREVIEW
211
212
213
214
215
25
6c
READY TO COPY
NUMBER OF COPIES
1
DOCUMENT IMAGE QUALITY
CHARACTERS
AUTO COLOR
COLOR
NORMAL
DENSITY
AUTOMATIC
PAPER
100%
MAGNIFICATION
SINGLE > SINGLE SIDE
DOUBLE SIDE/ PAGE AGGREGATION
GROUP
FINISH
200, 220
230
250
POWER
REGISTRATION 1
REGISTRATION 2
REGISTRATION 3
START
STOP
RESET
201
202
203
204
205
206
207
210

FIG. 5

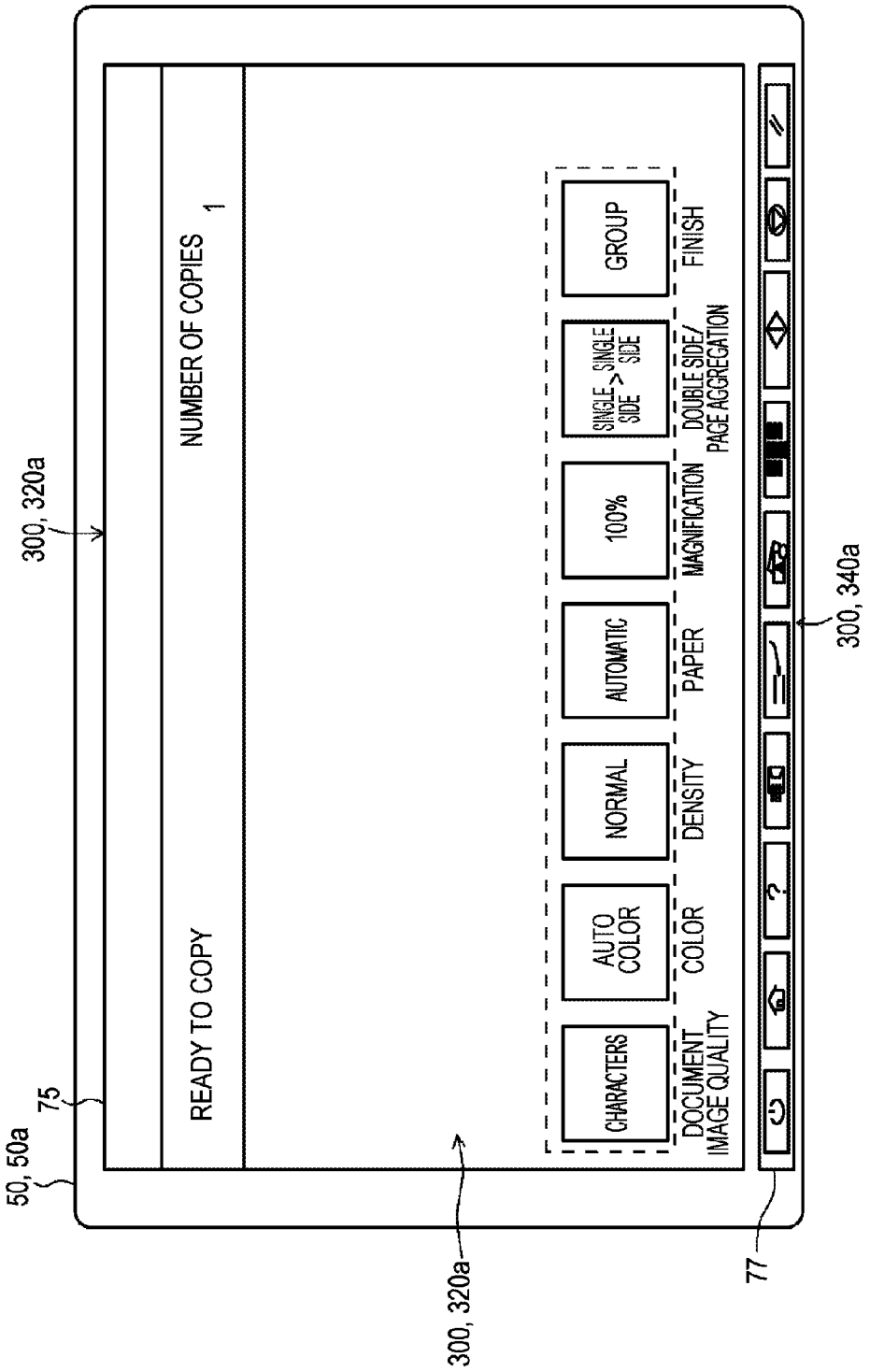

300, 320a
NUMBER OF COPIES 1
READY TO COPY
50, 50a
75
CHARACTERS
AUTO COLOR
NORMAL
AUTOMATIC
100%
SINGLE->SINGLE SIDE
GROUP
DOCUMENT IMAGE QUALITY
COLOR
DENSITY
PAPER
MAGNIFICATION
DOUBLE SIDE/ PAGE AGGREGATION
FINISH
300, 320a
77
300, 340a

FIG. 6

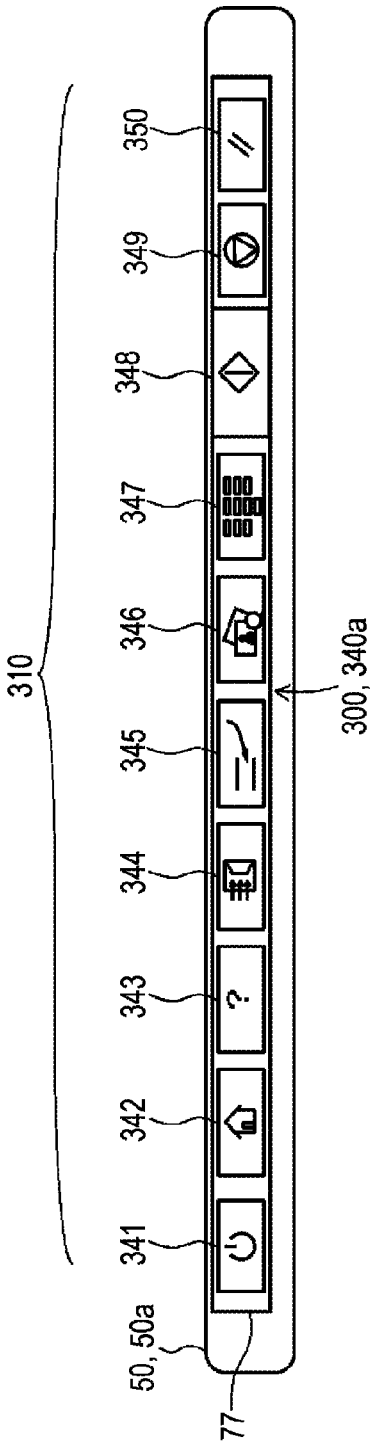


FIG. 7

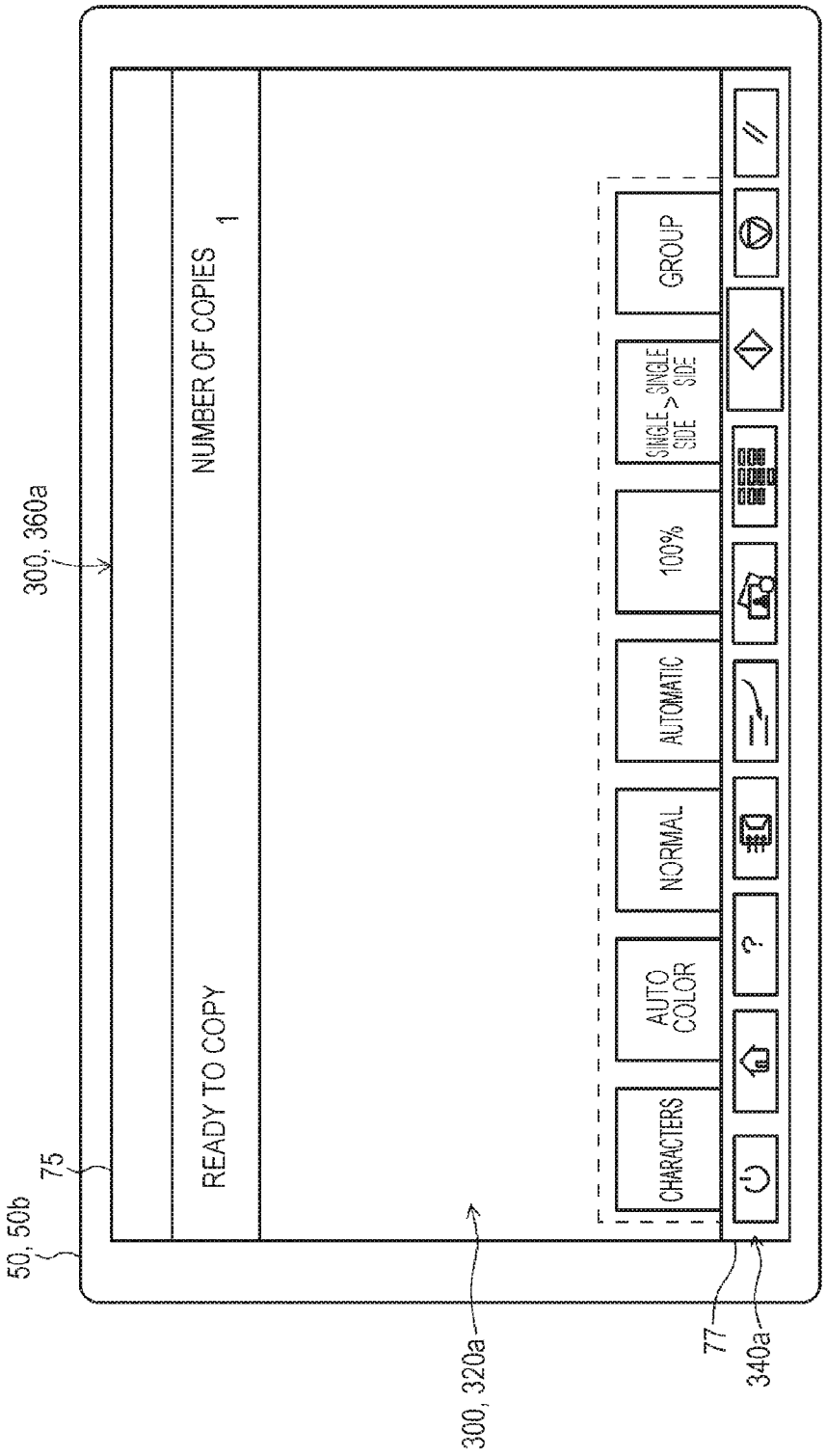

300, 360a
NUMBER OF COPIES 1
READY TO COPY
CHARACTERS
AUTO COLOR
NORMAL
AUTOMATIC
100%
SINGLE > SINGLE SIDE
GROUP
50, 50b
75
300, 320a
77
340a

FIG. 8

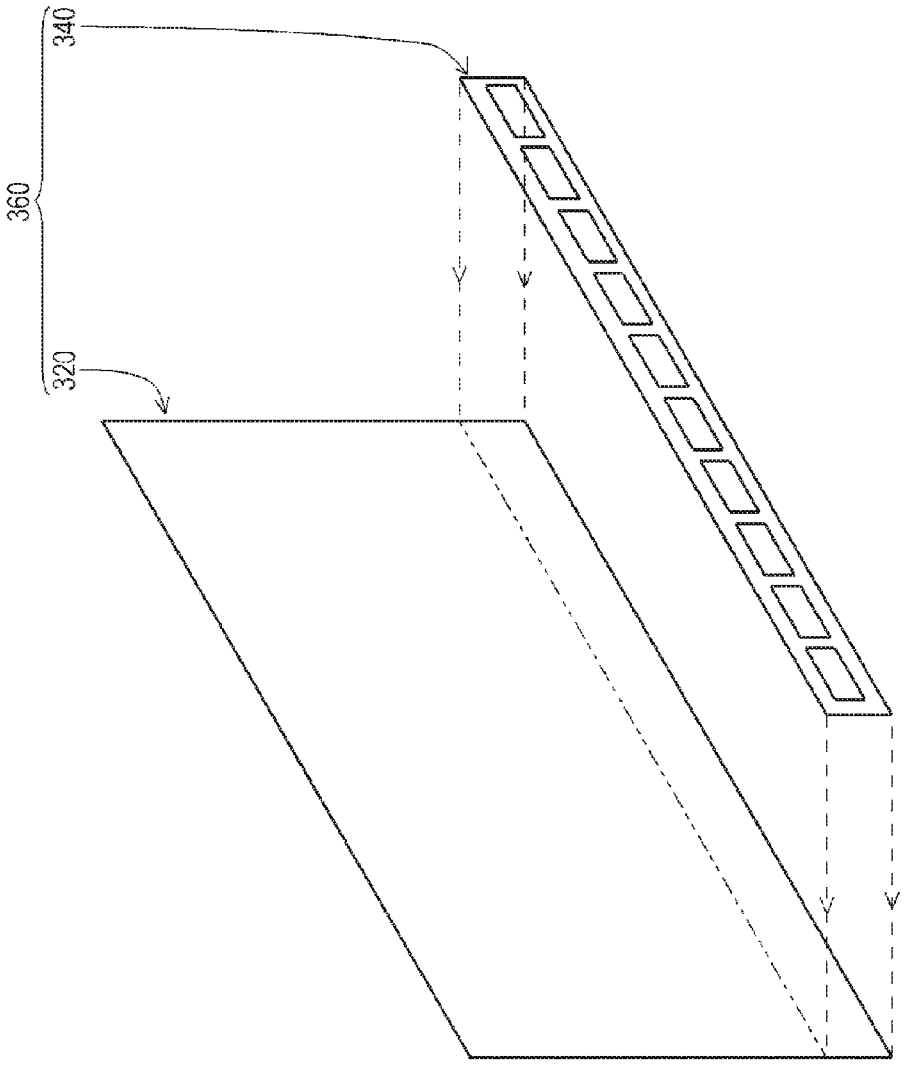


FIG. 9

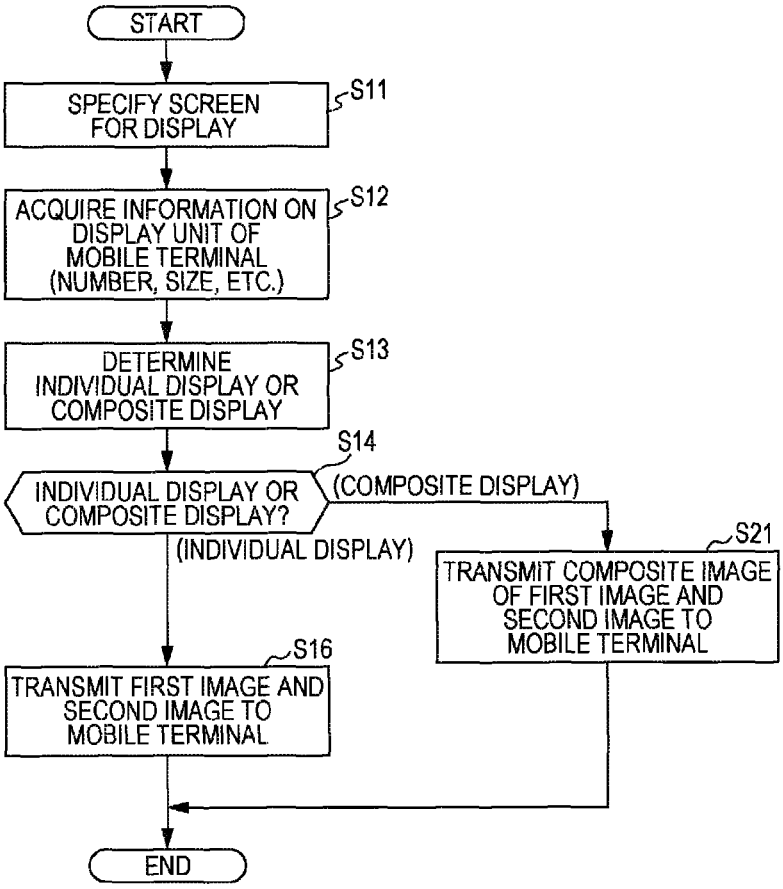

START
SPECIFY SCREEN FOR DISPLAY
S11
ACQUIRE INFORMATION ON DISPLAY UNIT OF MOBILE TERMINAL (NUMBER, SIZE, ETC.)
S12
DETERMINE INDIVIDUAL DISPLAY OR COMPOSITE DISPLAY
S13
INDIVIDUAL DISPLAY OR COMPOSITE DISPLAY?
S14
(COMPOSITE DISPLAY)
(INDIVIDUAL DISPLAY)
TRANSMIT COMPOSITE IMAGE OF FIRST IMAGE AND SECOND IMAGE TO MOBILE TERMINAL
S21
TRANSMIT FIRST IMAGE AND SECOND IMAGE TO MOBILE TERMINAL
S16
END

FIG. 10

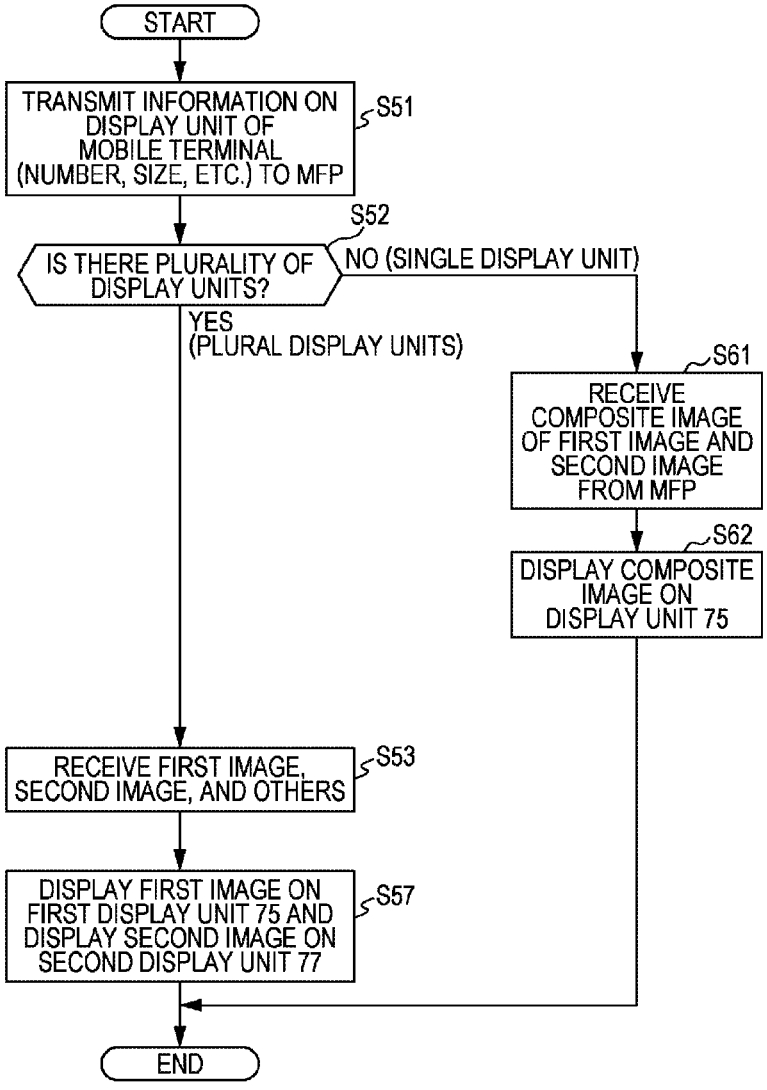

START
TRANSMIT INFORMATION ON DISPLAY UNIT OF MOBILE TERMINAL (NUMBER, SIZE, ETC.) TO MFP
S51
S52
IS THERE PLURALITY OF DISPLAY UNITS?
NO (SINGLE DISPLAY UNIT)
YES (PLURAL DISPLAY UNITS)
S61
RECEIVE COMPOSITE IMAGE OF FIRST IMAGE AND SECOND IMAGE FROM MFP
S62
DISPLAY COMPOSITE IMAGE ON DISPLAY UNIT 75
RECEIVE FIRST IMAGE, SECOND IMAGE, AND OTHERS
S53
DISPLAY FIRST IMAGE ON FIRST DISPLAY UNIT 75 AND DISPLAY SECOND IMAGE ON SECOND DISPLAY UNIT 77
S57
END

FIG. 11

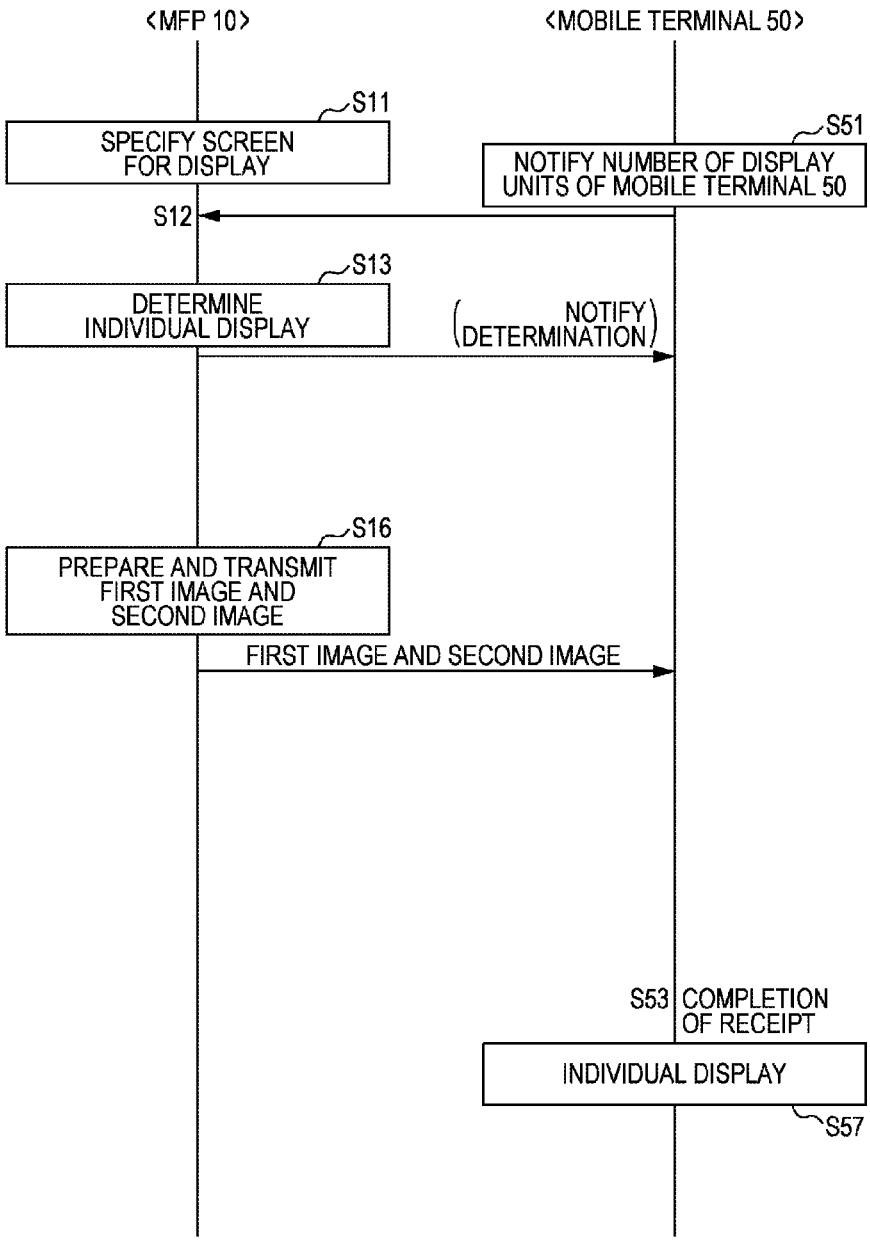

<MFP 10>
<MOBILE TERMINAL 50>
S11
SPECIFY SCREEN FOR DISPLAY
S51
NOTIFY NUMBER OF DISPLAY UNITS OF MOBILE TERMINAL 50
S12
S13
DETERMINE INDIVIDUAL DISPLAY
(NOTIFY DETERMINATION)
S16
PREPARE AND TRANSMIT FIRST IMAGE AND SECOND IMAGE
FIRST IMAGE AND SECOND IMAGE
S53 COMPLETION OF RECEIPT
INDIVIDUAL DISPLAY
S57

FIG. 12

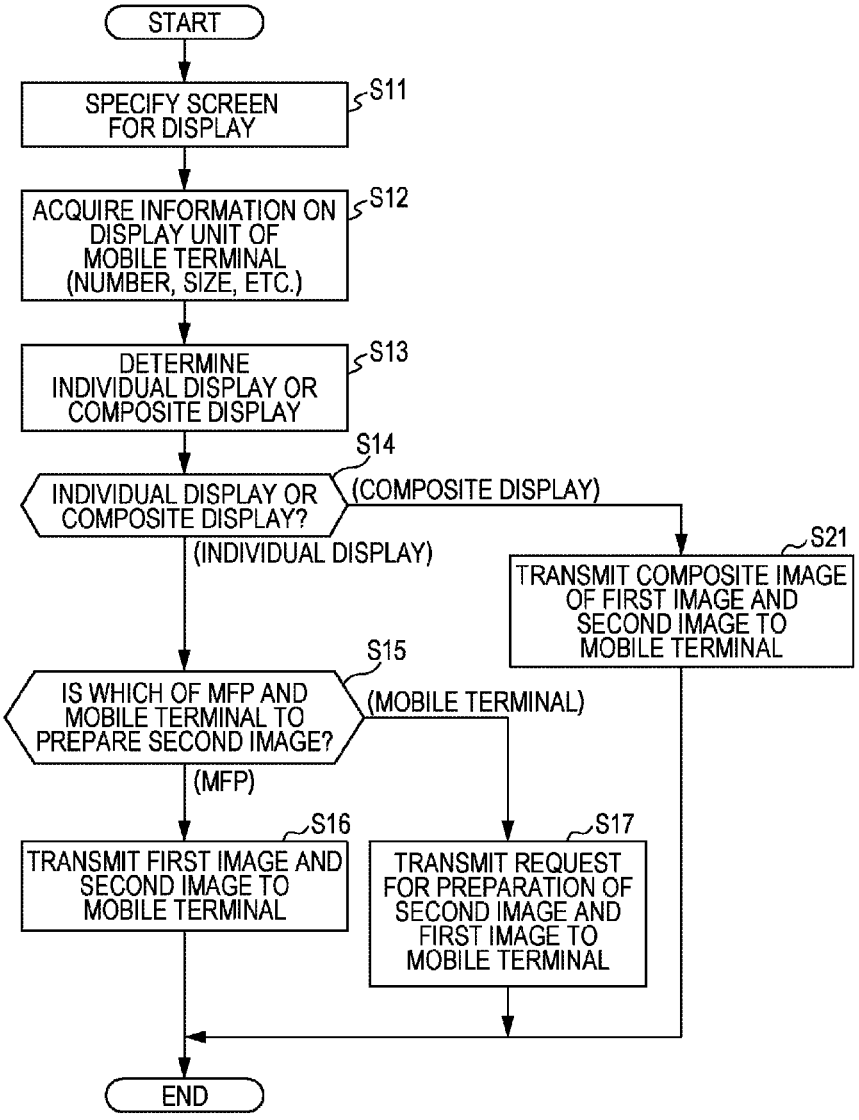

START
SPECIFY SCREEN FOR DISPLAY
S11
ACQUIRE INFORMATION ON DISPLAY UNIT OF MOBILE TERMINAL (NUMBER, SIZE, ETC.)
S12
DETERMINE INDIVIDUAL DISPLAY OR COMPOSITE DISPLAY
S13
INDIVIDUAL DISPLAY OR COMPOSITE DISPLAY?
S14
(COMPOSITE DISPLAY)
(INDIVIDUAL DISPLAY)
TRANSMIT COMPOSITE IMAGE OF FIRST IMAGE AND SECOND IMAGE TO MOBILE TERMINAL
S21
IS WHICH OF MFP AND MOBILE TERMINAL TO PREPARE SECOND IMAGE?
S15
(MOBILE TERMINAL)
(MFP)
TRANSMIT FIRST IMAGE AND SECOND IMAGE TO MOBILE TERMINAL
S16
TRANSMIT REQUEST FOR PREPARATION OF SECOND IMAGE AND FIRST IMAGE TO MOBILE TERMINAL
S17
END

FIG. 13

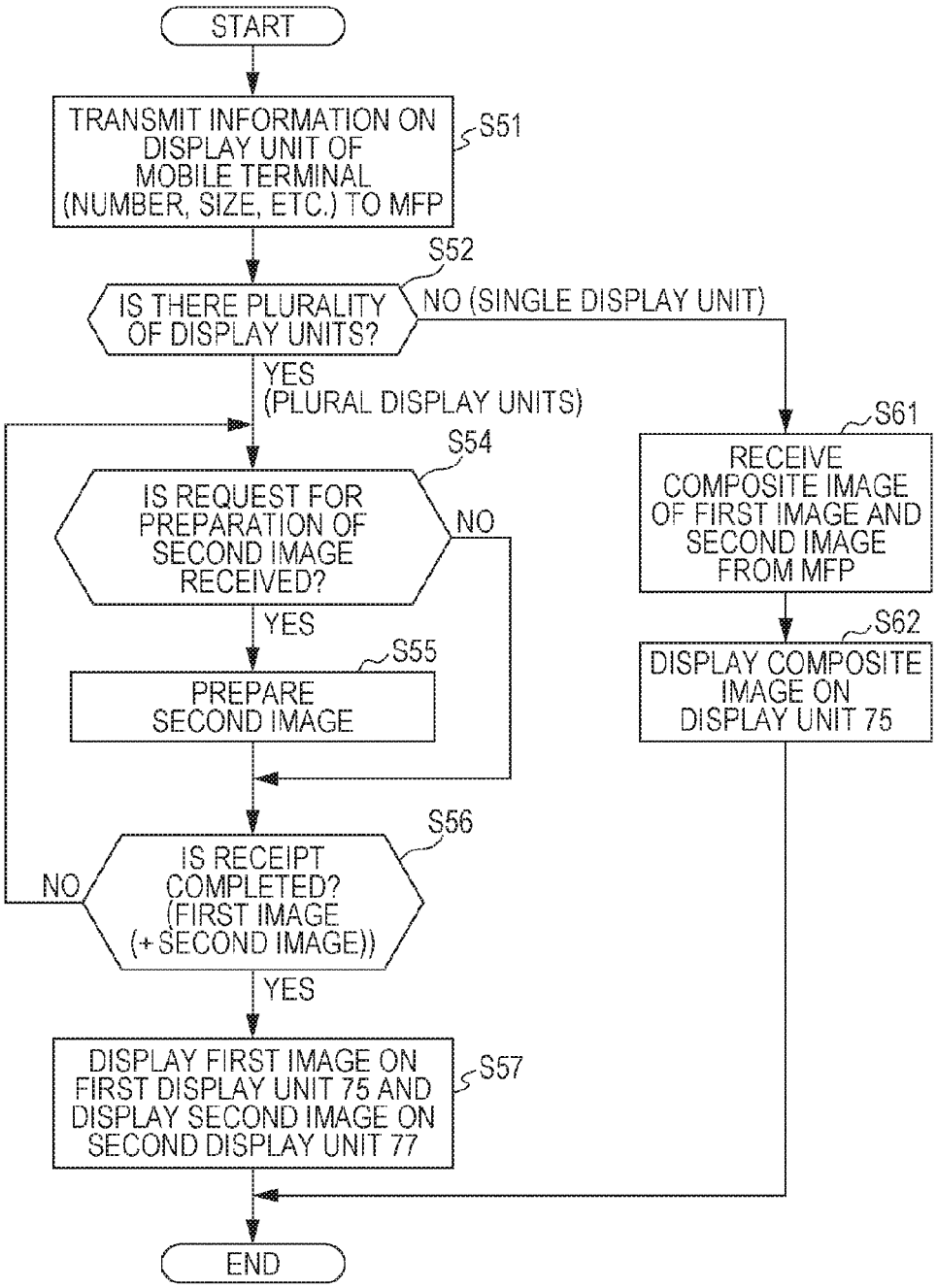

START
TRANSMIT INFORMATION ON DISPLAY UNIT OF MOBILE TERMINAL (NUMBER, SIZE, ETC.) TO MFP
S51
S52
IS THERE PLURALITY OF DISPLAY UNITS?
NO (SINGLE DISPLAY UNIT)
YES (PLURAL DISPLAY UNITS)
S61
RECEIVE COMPOSITE IMAGE OF FIRST IMAGE AND SECOND IMAGE FROM MFP
S54
IS REQUEST FOR PREPARATION OF SECOND IMAGE RECEIVED?
NO
YES
S55
PREPARE SECOND IMAGE
S62
DISPLAY COMPOSITE IMAGE ON DISPLAY UNIT 75
S56
IS RECEIPT COMPLETED? (FIRST IMAGE (+SECOND IMAGE))
NO
YES
DISPLAY FIRST IMAGE ON FIRST DISPLAY UNIT 75 AND DISPLAY SECOND IMAGE ON SECOND DISPLAY UNIT 77
S57
END

FIG. 14

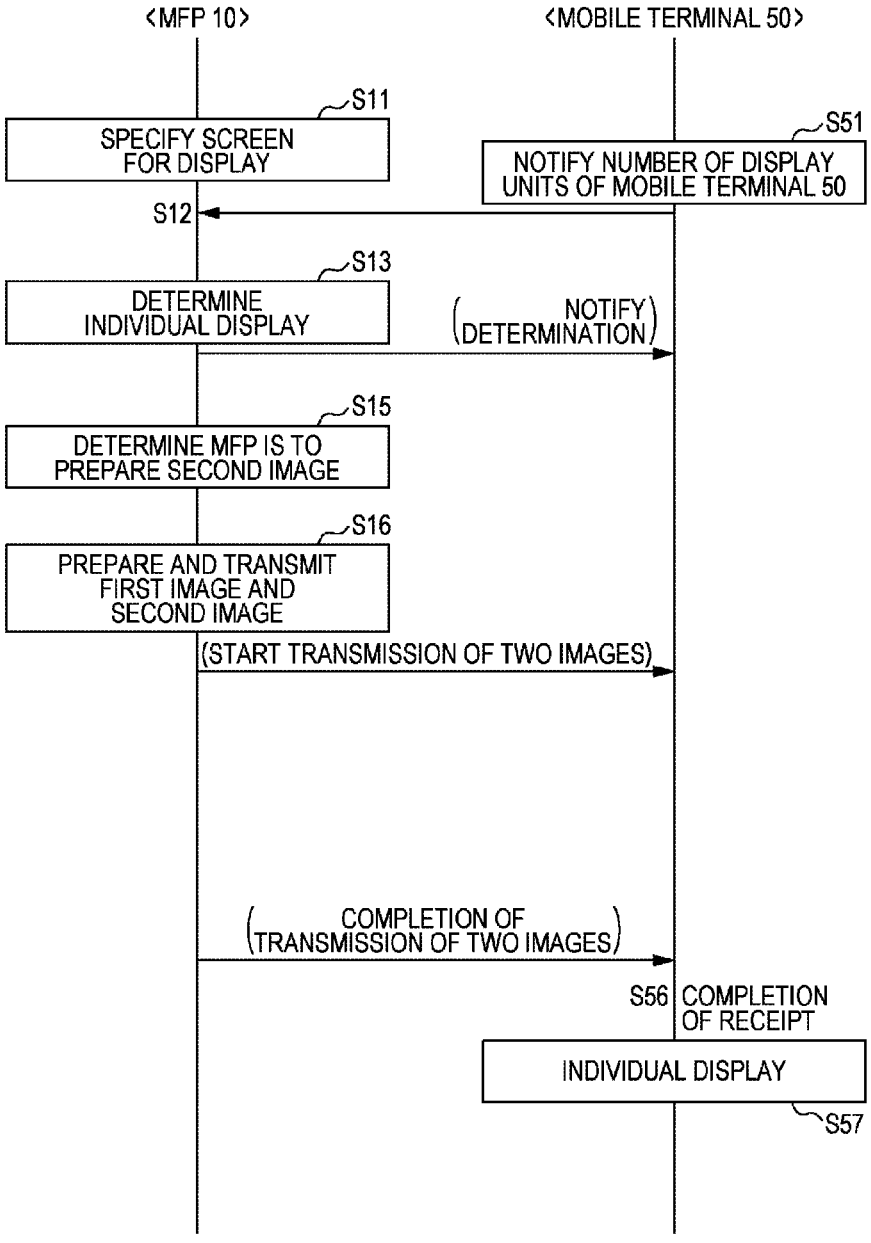

<MFP 10>
<MOBILE TERMINAL 50>
S11
SPECIFY SCREEN FOR DISPLAY
S51
NOTIFY NUMBER OF DISPLAY UNITS OF MOBILE TERMINAL 50
S12
S13
DETERMINE INDIVIDUAL DISPLAY
(NOTIFY DETERMINATION)
S15
DETERMINE MFP IS TO PREPARE SECOND IMAGE
S16
PREPARE AND TRANSMIT FIRST IMAGE AND SECOND IMAGE
(START TRANSMISSION OF TWO IMAGES)
(COMPLETION OF TRANSMISSION OF TWO IMAGES)
S56
COMPLETION OF RECEIPT
INDIVIDUAL DISPLAY
S57

FIG. 15

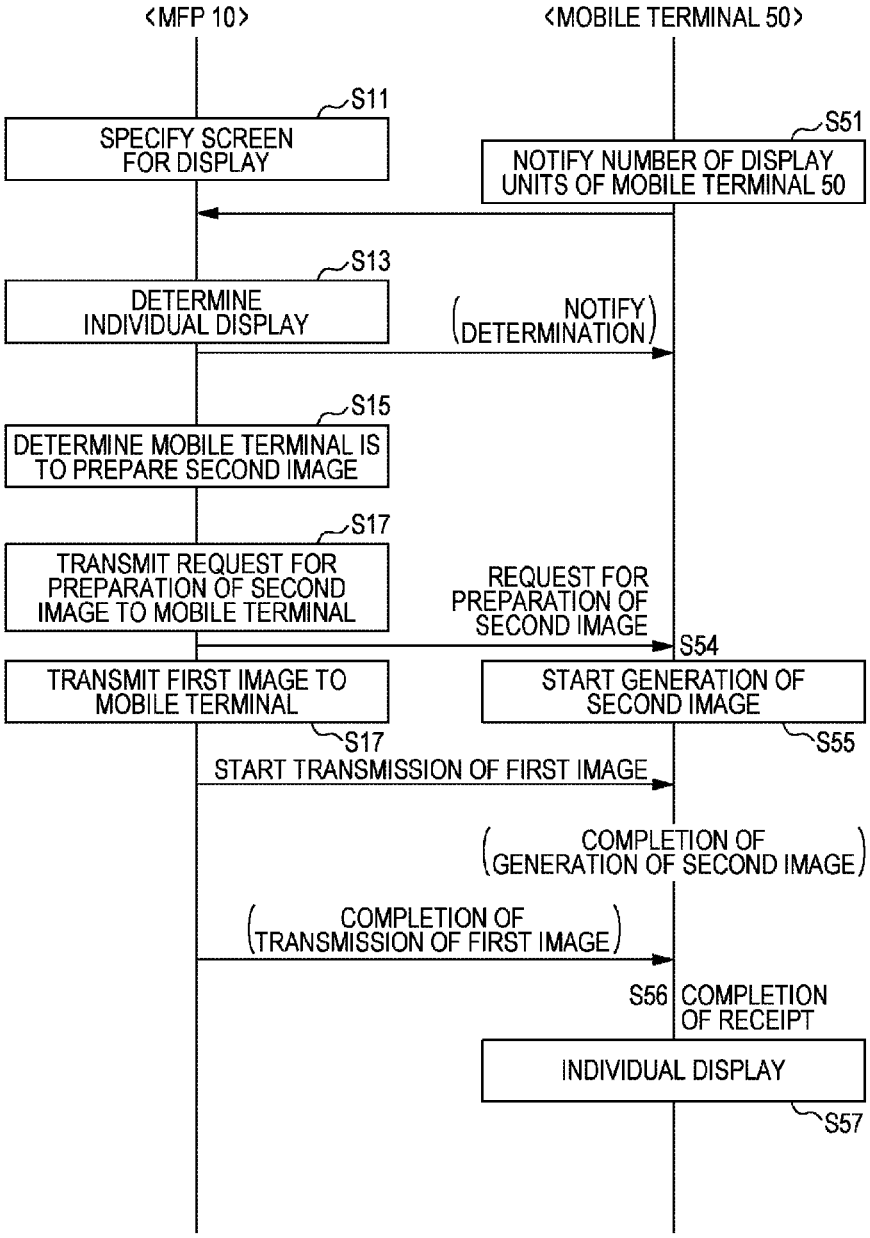

<MFP 10>
<MOBILE TERMINAL 50>
S11
SPECIFY SCREEN FOR DISPLAY
S51
NOTIFY NUMBER OF DISPLAY UNITS OF MOBILE TERMINAL 50
S13
DETERMINE INDIVIDUAL DISPLAY
(NOTIFY DETERMINATION)
S15
DETERMINE MOBILE TERMINAL IS TO PREPARE SECOND IMAGE
S17
TRANSMIT REQUEST FOR PREPARATION OF SECOND IMAGE TO MOBILE TERMINAL
REQUEST FOR PREPARATION OF SECOND IMAGE
S54
TRANSMIT FIRST IMAGE TO MOBILE TERMINAL
START GENERATION OF SECOND IMAGE
S17
S55
START TRANSMISSION OF FIRST IMAGE
(COMPLETION OF GENERATION OF SECOND IMAGE)
(COMPLETION OF TRANSMISSION OF FIRST IMAGE)
S56
COMPLETION OF RECEIPT
INDIVIDUAL DISPLAY
S57

FIG. 16

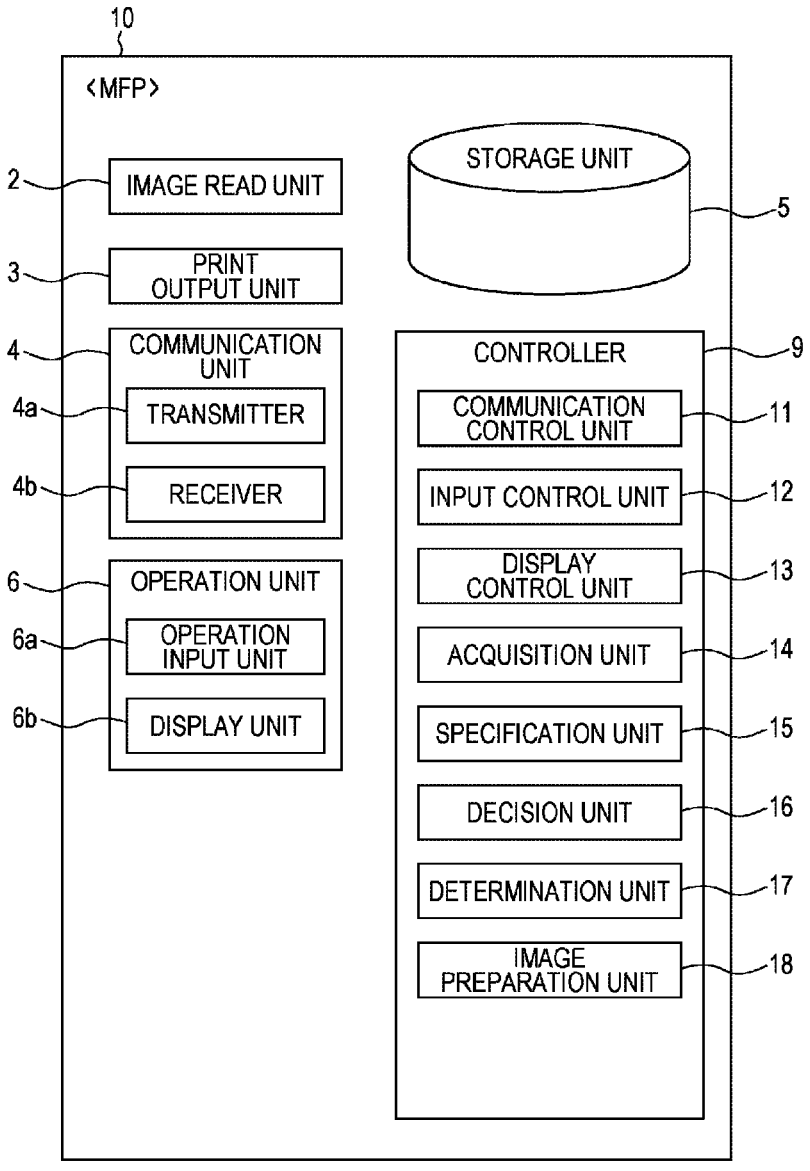

10
<MFP>
2
IMAGE READ UNIT
3
PRINT OUTPUT UNIT
4
COMMUNICATION UNIT
4a
TRANSMITTER
4b
RECEIVER
6
OPERATION UNIT
6a
OPERATION INPUT UNIT
6b
DISPLAY UNIT
STORAGE UNIT
5
CONTROLLER
9
COMMUNICATION CONTROL UNIT
11
INPUT CONTROL UNIT
12
DISPLAY CONTROL UNIT
13
ACQUISITION UNIT
14
SPECIFICATION UNIT
15
DECISION UNIT
16
DETERMINATION UNIT
17
IMAGE PREPARATION UNIT
18

FIG. 17

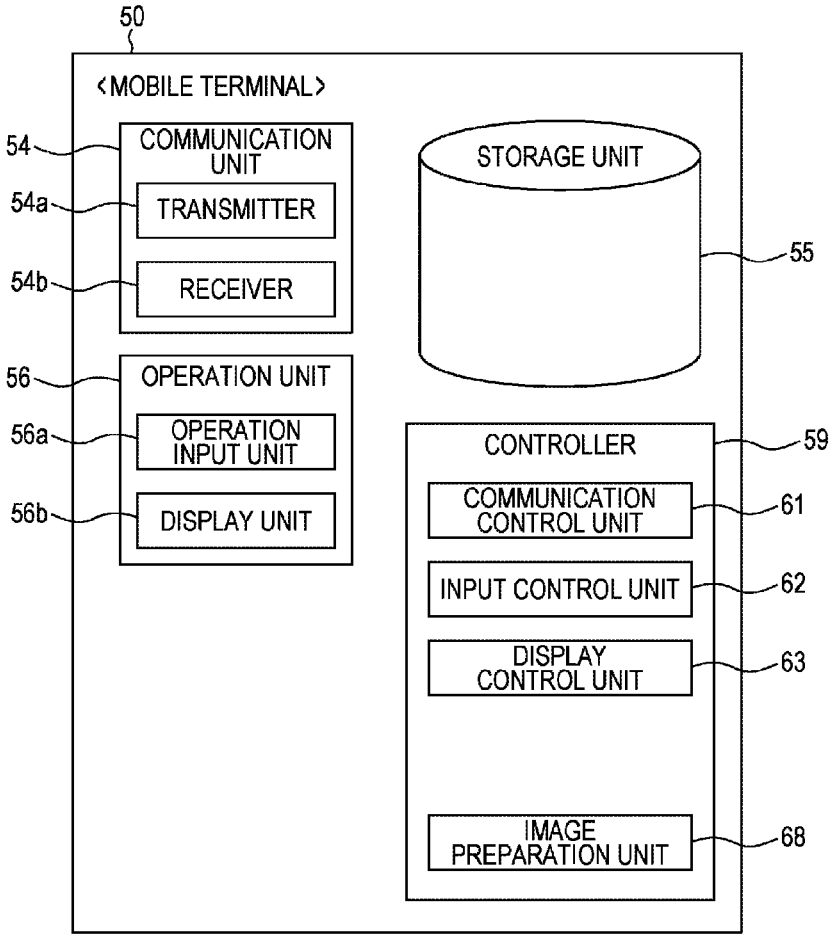

50
<MOBILE TERMINAL>
54
COMMUNICATION UNIT
54a
TRANSMITTER
54b
RECEIVER
56
OPERATION UNIT
56a
OPERATION INPUT UNIT
56b
DISPLAY UNIT
STORAGE UNIT
55
CONTROLLER
59
COMMUNICATION CONTROL UNIT
61
INPUT CONTROL UNIT
62
DISPLAY CONTROL UNIT
63
IMAGE PREPARATION UNIT
68

FIG. 18

ID	X	Y	W	H
0001	X1	Y1	W1	H1
0002	X2	Y2	W2	H2
0003	X3	Y3	W3	H3
0004	X4	Y4	W4	H4

⋮

FIG. 19

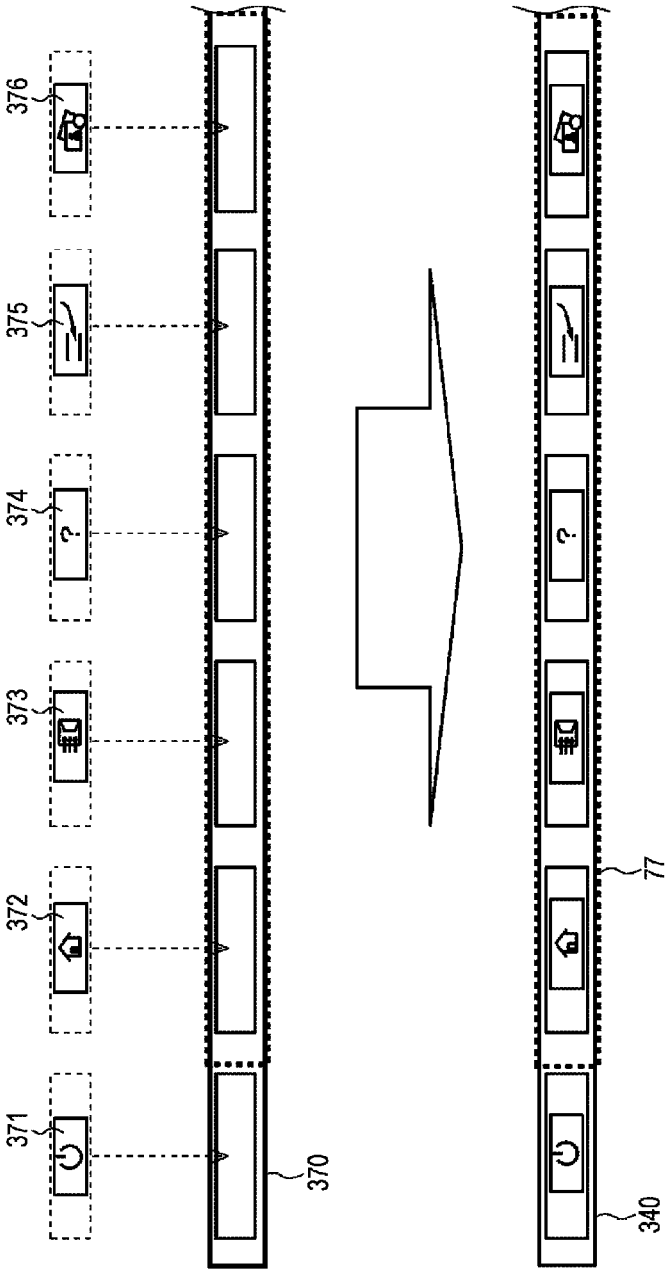


FIG. 20

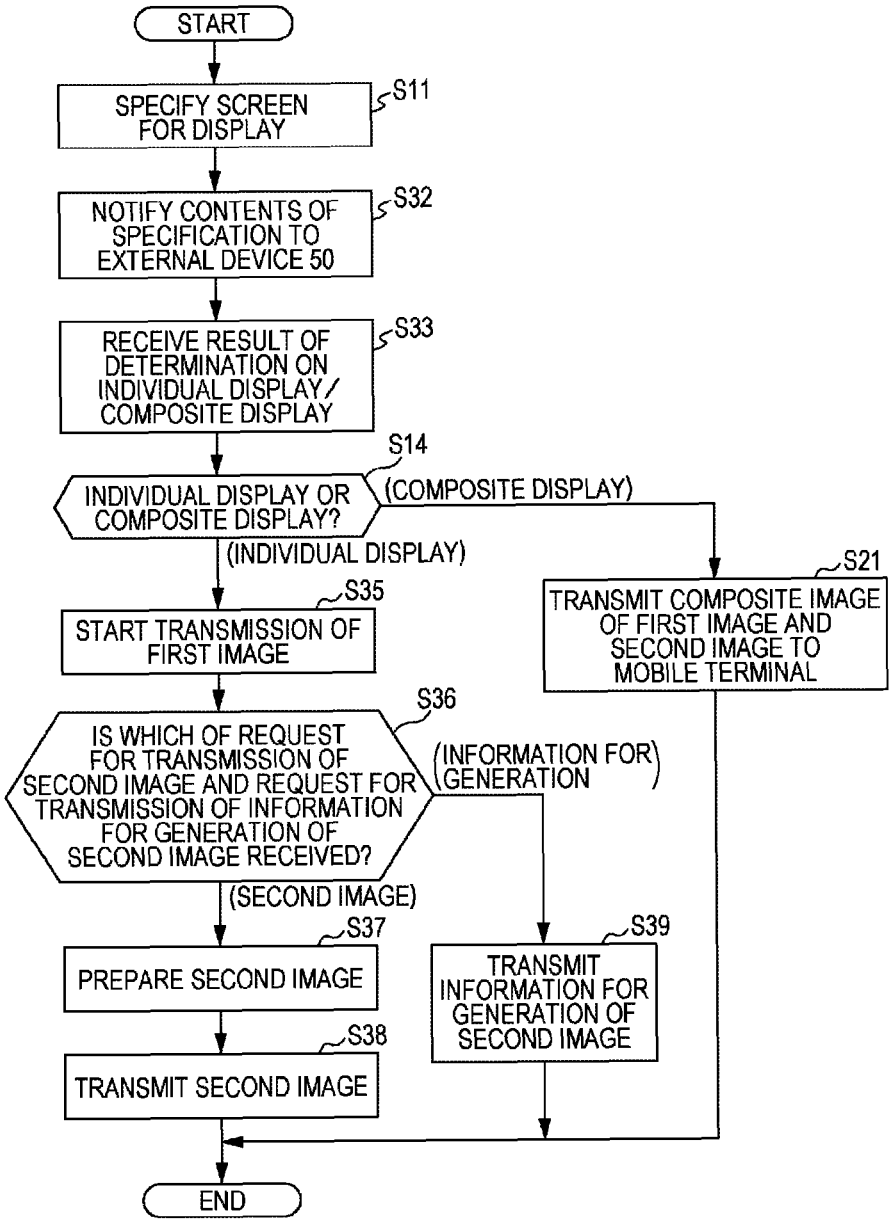

START
SPECIFY SCREEN FOR DISPLAY
S11
NOTIFY CONTENTS OF SPECIFICATION TO EXTERNAL DEVICE 50
S32
RECEIVE RESULT OF DETERMINATION ON INDIVIDUAL DISPLAY/ COMPOSITE DISPLAY
S33
S14
INDIVIDUAL DISPLAY OR COMPOSITE DISPLAY?
(COMPOSITE DISPLAY)
(INDIVIDUAL DISPLAY)
S21
TRANSMIT COMPOSITE IMAGE OF FIRST IMAGE AND SECOND IMAGE TO MOBILE TERMINAL
S35
START TRANSMISSION OF FIRST IMAGE
S36
IS WHICH OF REQUEST FOR TRANSMISSION OF SECOND IMAGE AND REQUEST FOR TRANSMISSION OF INFORMATION FOR GENERATION OF SECOND IMAGE RECEIVED?
(INFORMATION FOR GENERATION)
(SECOND IMAGE)
S37
PREPARE SECOND IMAGE
S39
TRANSMIT INFORMATION FOR GENERATION OF SECOND IMAGE
S38
TRANSMIT SECOND IMAGE
END

FIG. 21

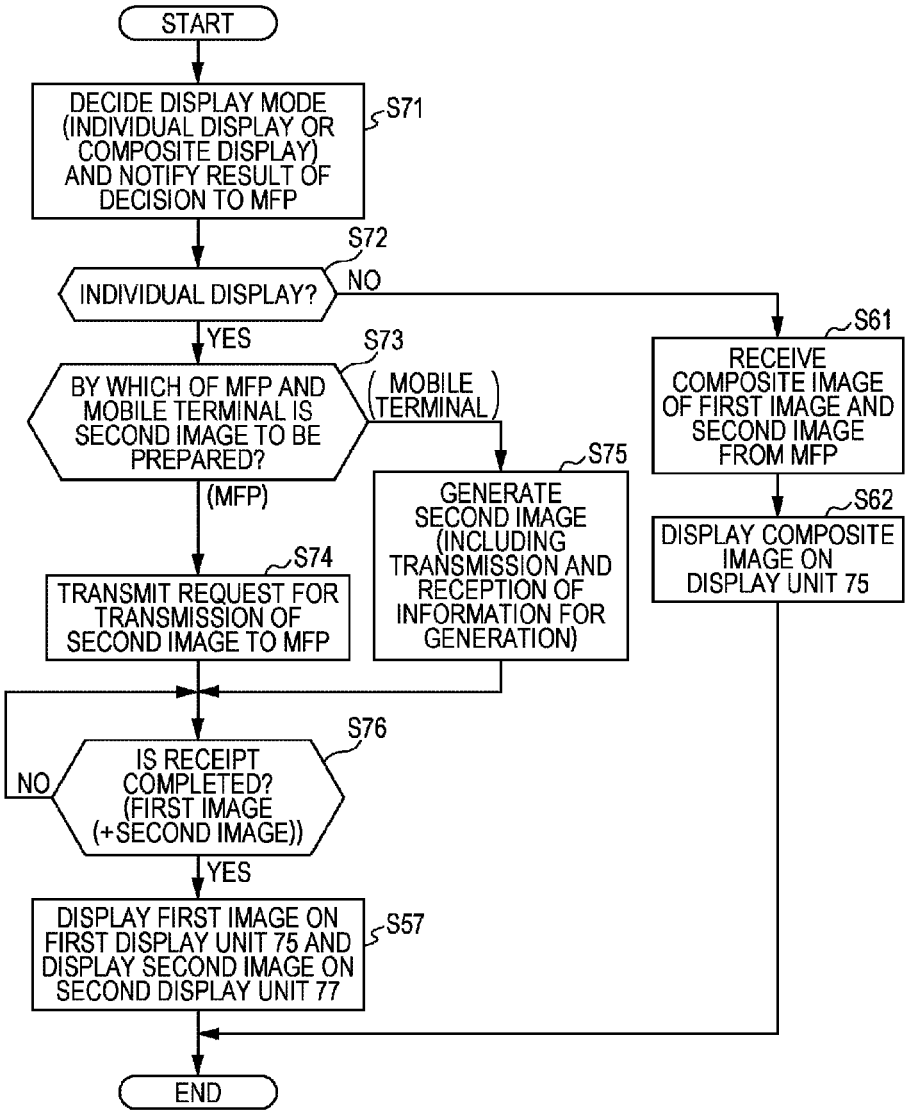

START
DECIDE DISPLAY MODE (INDIVIDUAL DISPLAY OR COMPOSITE DISPLAY) AND NOTIFY RESULT OF DECISION TO MFP
S71
S72
INDIVIDUAL DISPLAY?
NO
YES
S61
RECEIVE COMPOSITE IMAGE OF FIRST IMAGE AND SECOND IMAGE FROM MFP
S73
BY WHICH OF MFP AND MOBILE TERMINAL IS SECOND IMAGE TO BE PREPARED?
MOBILE TERMINAL
(MFP)
S75
GENERATE SECOND IMAGE (INCLUDING TRANSMISSION AND RECEPTION OF INFORMATION FOR GENERATION)
S62
DISPLAY COMPOSITE IMAGE ON DISPLAY UNIT 75
S74
TRANSMIT REQUEST FOR TRANSMISSION OF SECOND IMAGE TO MFP
S76
NO
IS RECEIPT COMPLETED? (FIRST IMAGE (+SECOND IMAGE))
YES
DISPLAY FIRST IMAGE ON FIRST DISPLAY UNIT 75 AND DISPLAY SECOND IMAGE ON SECOND DISPLAY UNIT 77
S57
END

FIG. 22

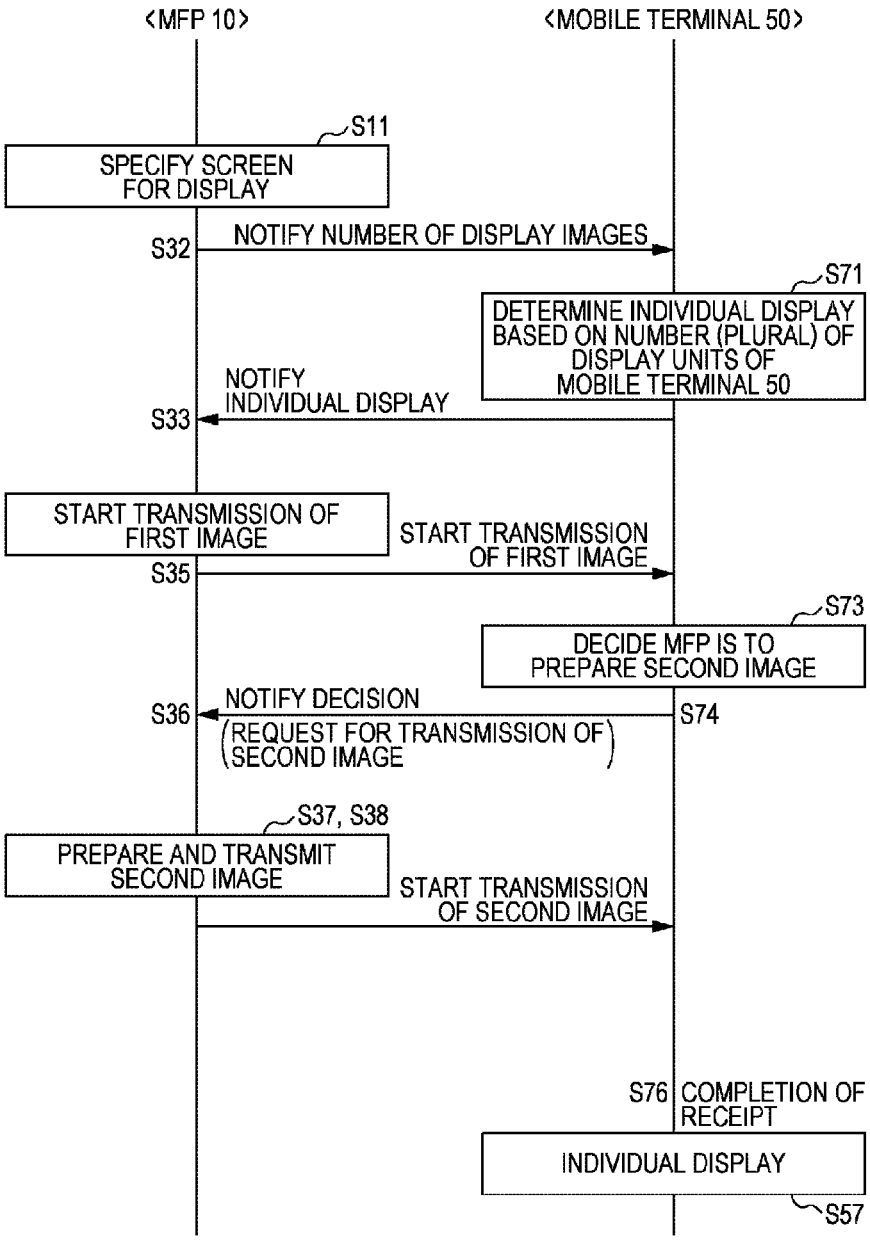

<MFP 10>
<MOBILE TERMINAL 50>
S11
SPECIFY SCREEN FOR DISPLAY
S32
NOTIFY NUMBER OF DISPLAY IMAGES
S71
DETERMINE INDIVIDUAL DISPLAY BASED ON NUMBER (PLURAL) OF DISPLAY UNITS OF MOBILE TERMINAL 50
NOTIFY INDIVIDUAL DISPLAY
S33
START TRANSMISSION OF FIRST IMAGE
START TRANSMISSION OF FIRST IMAGE
S35
S73
DECIDE MFP IS TO PREPARE SECOND IMAGE
NOTIFY DECISION
S36
(REQUEST FOR TRANSMISSION OF SECOND IMAGE)
S74
S37, S38
PREPARE AND TRANSMIT SECOND IMAGE
START TRANSMISSION OF SECOND IMAGE
S76
COMPLETION OF RECEIPT
INDIVIDUAL DISPLAY
S57

FIG. 23

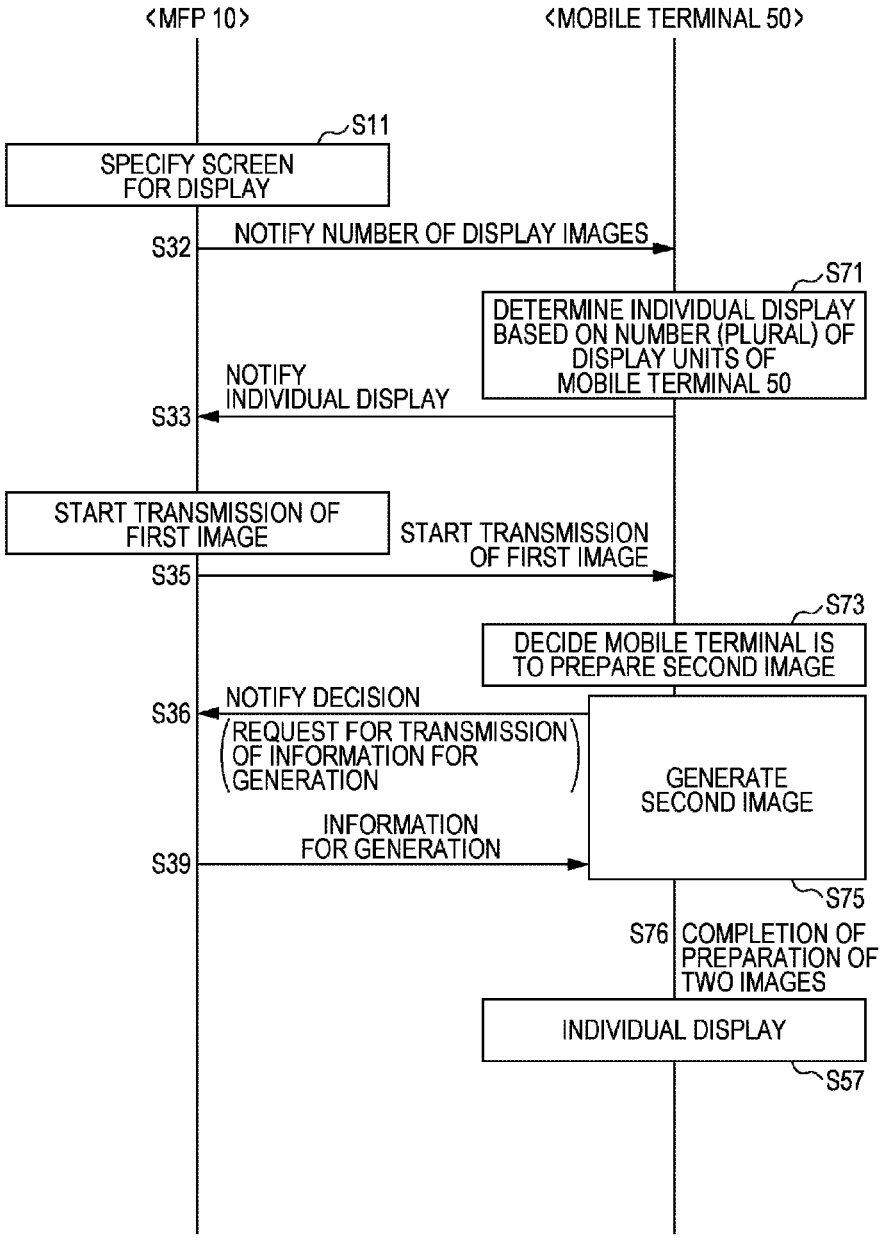

<MFP 10>
<MOBILE TERMINAL 50>
S11
SPECIFY SCREEN FOR DISPLAY
S32
NOTIFY NUMBER OF DISPLAY IMAGES
S71
DETERMINE INDIVIDUAL DISPLAY BASED ON NUMBER (PLURAL) OF DISPLAY UNITS OF MOBILE TERMINAL 50
NOTIFY INDIVIDUAL DISPLAY
S33
START TRANSMISSION OF FIRST IMAGE
START TRANSMISSION OF FIRST IMAGE
S35
S73
DECIDE MOBILE TERMINAL IS TO PREPARE SECOND IMAGE
NOTIFY DECISION
S36
(REQUEST FOR TRANSMISSION OF INFORMATION FOR GENERATION)
GENERATE SECOND IMAGE
INFORMATION FOR GENERATION
S39
S75
S76
COMPLETION OF PREPARATION OF TWO IMAGES
INDIVIDUAL DISPLAY
S57

FIG. 24

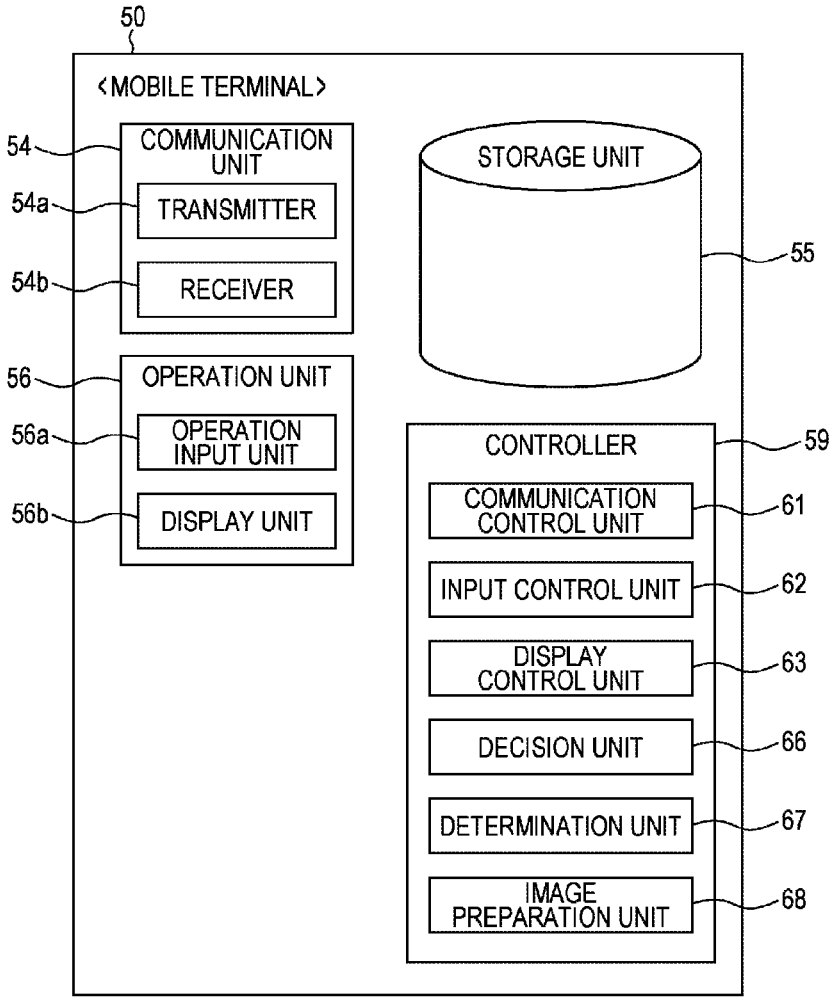

50
<MOBILE TERMINAL>
54
COMMUNICATION UNIT
54a
TRANSMITTER
54b
RECEIVER
56
OPERATION UNIT
56a
OPERATION INPUT UNIT
56b
DISPLAY UNIT
STORAGE UNIT
55
CONTROLLER
59
COMMUNICATION CONTROL UNIT
61
INPUT CONTROL UNIT
62
DISPLAY CONTROL UNIT
63
DECISION UNIT
66
DETERMINATION UNIT
67
IMAGE PREPARATION UNIT
68

FIG. 25

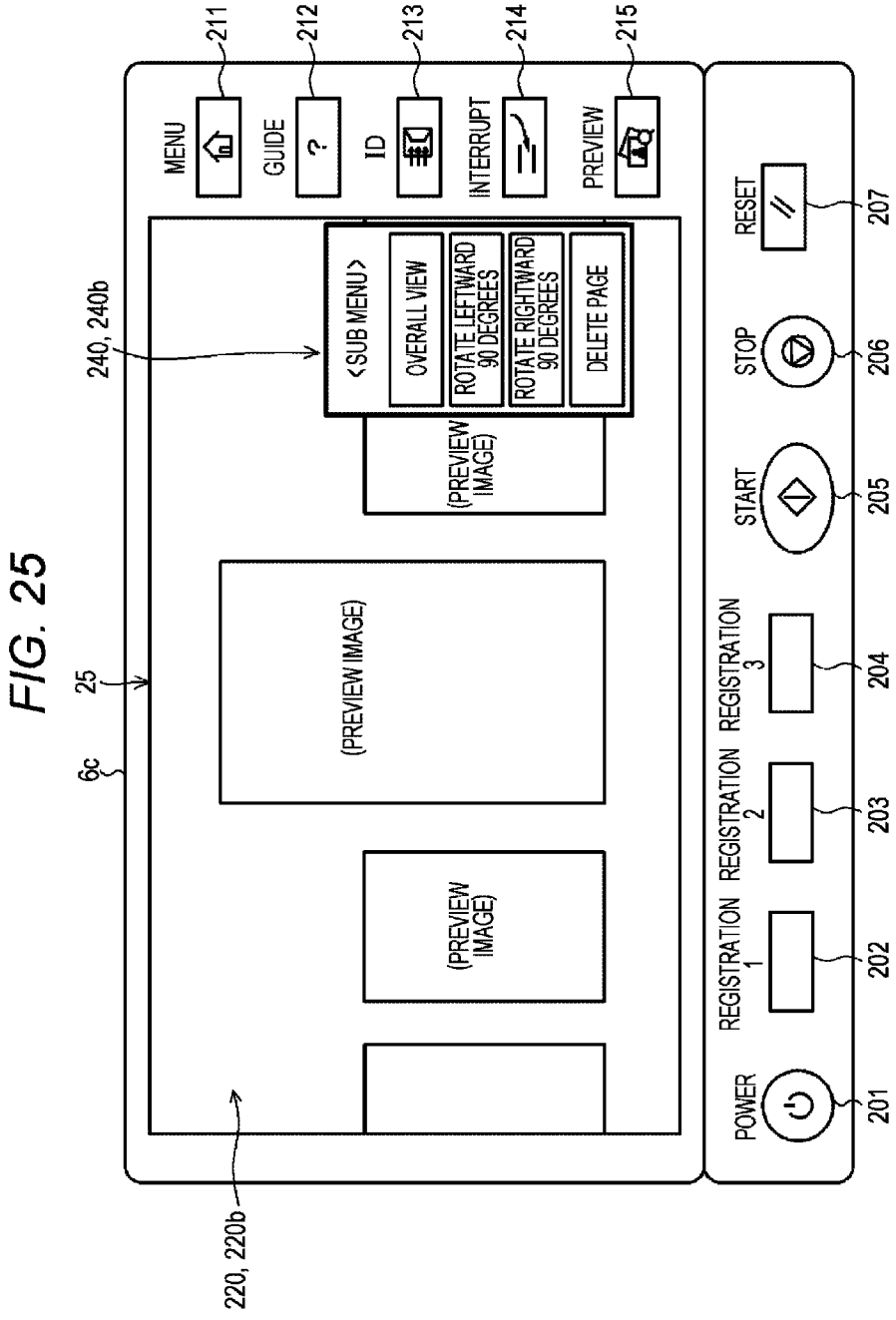

MENU
211
GUIDE
212
ID
213
INTERRUPT
214
PREVIEW
215
240, 240b
<SUB MENU>
OVERALL VIEW
ROTATE LEFTWARD 90 DEGREES
ROTATE RIGHTWARD 90 DEGREES
DELETE PAGE
(PREVIEW IMAGE)
(PREVIEW IMAGE)
(PREVIEW IMAGE)
25
6c
220, 220b
POWER
201
REGISTRATION 1
202
REGISTRATION 2
203
REGISTRATION 3
204
START
205
STOP
206
RESET
207

FIG. 26

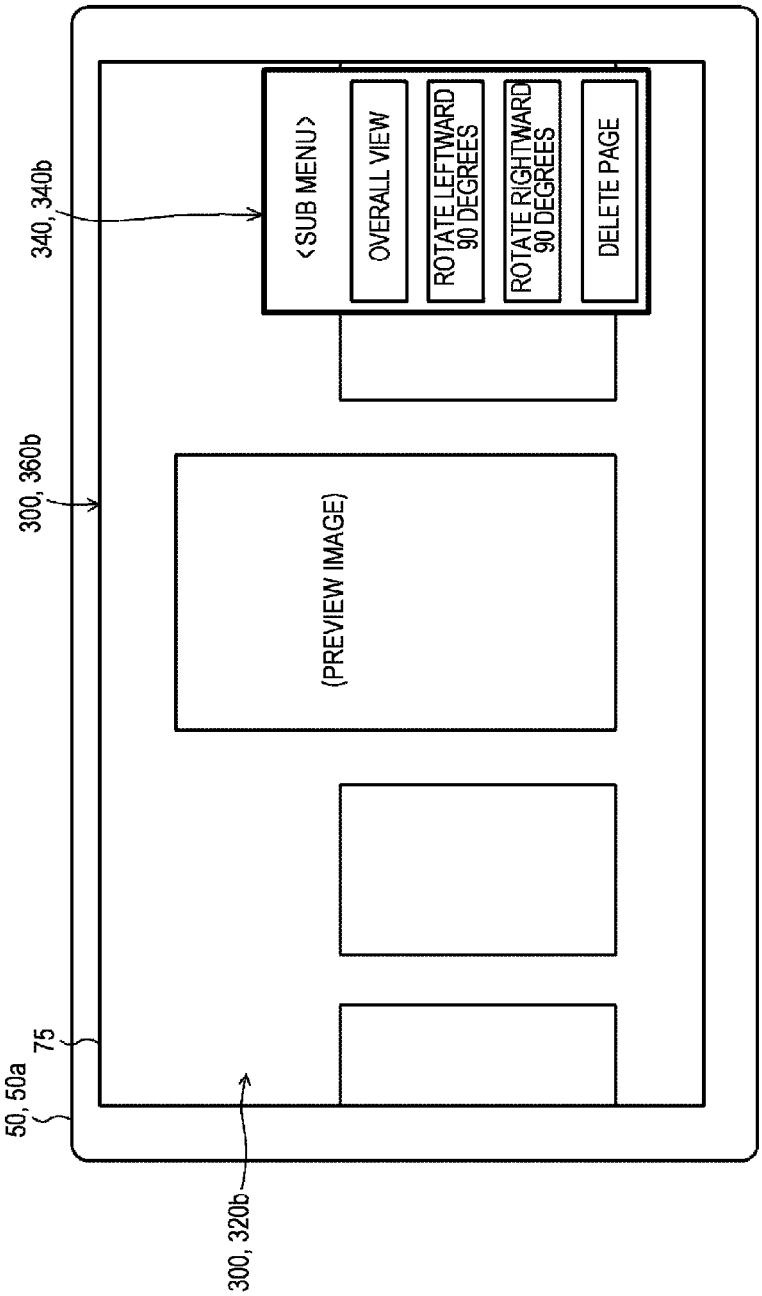

340, 340b
<SUB MENU>
OVERALL VIEW
ROTATE LEFTWARD 90 DEGREES
ROTATE RIGHTWARD 90 DEGREES
DELETE PAGE
300, 360b
(PREVIEW IMAGE)
75
50, 50a
300, 320b

FIG. 27

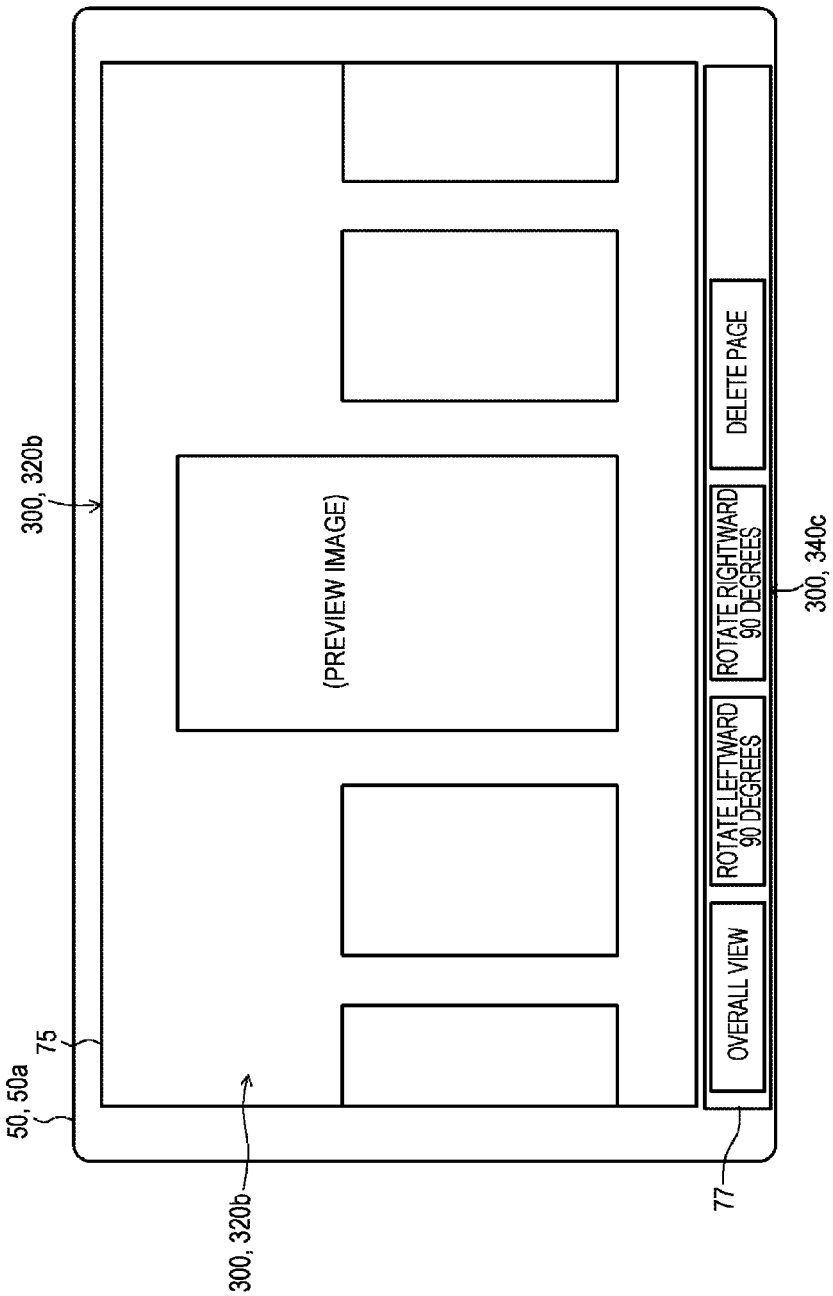
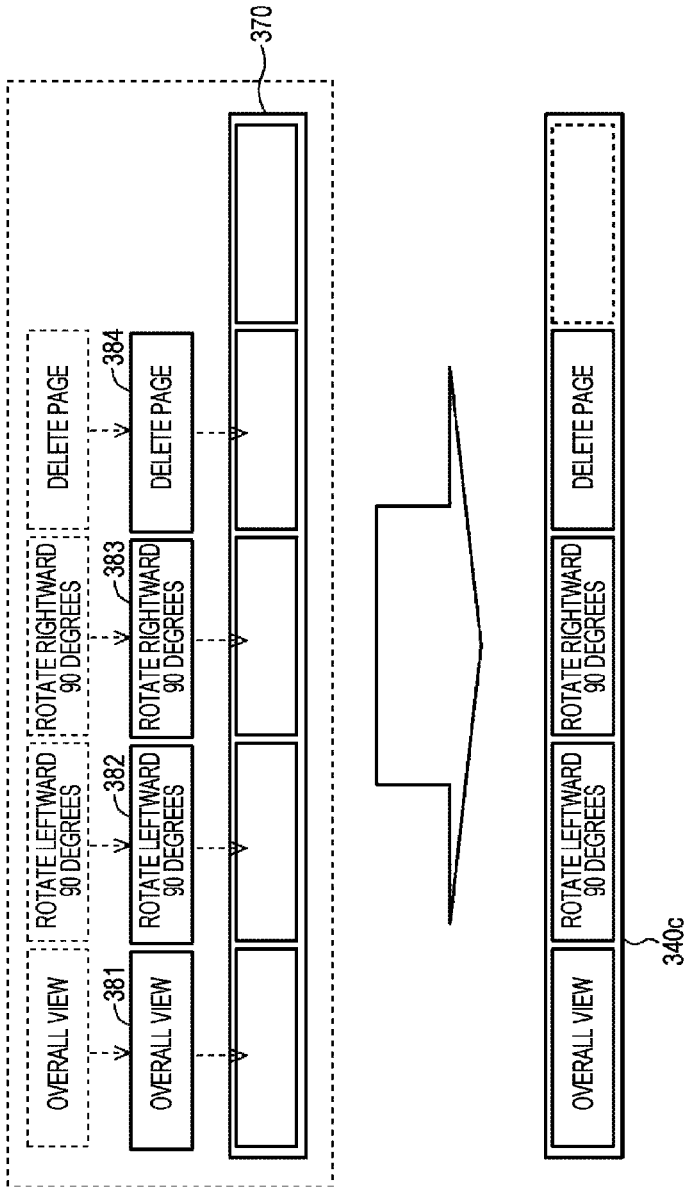

300, 320b
(PREVIEW IMAGE)
DELETE PAGE
ROTATE RIGHTWARD 90 DEGREES
300, 340c
ROTATE LEFTWARD 90 DEGREES
OVERALL VIEW
75
50, 50a
300, 320b
77

FIG. 28

ID	X	Y	W	H	ITEM NAME
0001	X1	Y1	W1	H1	OVERALL VIEW
0002	X2	Y2	W2	H2	ROTATE LEFTWARD 90 DEGREES
0003	X3	Y3	W3	H3	ROTATE RIGHTWARD 90 DEGREES
0004	X4	Y4	W4	H4	DELETE PAGE

⋮

FIG. 29


370
OVERALL VIEW
ROTATE LEFTWARD 90 DEGREES
ROTATE RIGHTWARD 90 DEGREES
DELETE PAGE
381
382
383
384
OVERALL VIEW
ROTATE LEFTWARD 90 DEGREES
ROTATE RIGHTWARD 90 DEGREES
DELETE PAGE
340c

SYSTEMS AND METHODS FOR DISPLAYING REMOTE OPERATION SCREENS OF AN IMAGE FORMING APPARATUS BASED ON A CONFIGURATION OF DISPLAY(S) OF A MOBILE TERMINAL

CROSS-REFERENCE TO RELATED APPLICATIONS

The present U.S. patent application claims priority to Japanese Patent Application No. 2015-034431, which was filed on Feb. 24, 2015. The entire disclosure of Japanese Patent Application No. 2015-034431, including description, claims, drawings, and abstract, is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an image forming system and techniques related to the same.

Description of the Related Art

There is a system that operates remotely an image forming apparatus (MFP (multi-functional peripheral) or the like) by use of a mobile terminal (also called image forming system or remote operation system). In such a system, a screen for remote operation is displayed on a display unit of the mobile terminal, and an operation target device is remotely operated through the screen for remote operation.

In addition, many image forming apparatuses have a touch panel provided in the operation panel. The user performs operation inputs through software keys in the operation panel. Some of image forming apparatuses further have hardware keys as well as the touch panel.

To operate remotely the image forming apparatus, it is preferably allowed to perform not only remote operations related to the software keys in the touch panel of the image forming apparatus but also remote operations related to the hardware keys provided in the MFP.

JP 2014-107800 A describes a technique for allowing remote operations related to software key images in the touch panel of the MFP and remote operations related to hardware keys provided in the MFP. Specifically, JP 2014-107800 A describes a technique by which hardware key images corresponding to the hardware keys in the MFP are superimposed on an image of the operation screen in the MFP (operation image) on the display of the mobile terminal.

However, according to the technique described in JP 2014-107800 A, the hardware key images are superimposed on the operation image including the software key images within one display of the mobile terminal. This poses a problem that the buttons (software key images in the operation image) and others (including various indications near the buttons) arranged under the hardware key images are difficult to view.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a remote operation technique by which reduction in visibility due to superimposition can be suppressed.

The foregoing problem is solved by the following configurations.

(1) To achieve the abovementioned object, according to an aspect, an image forming apparatus capable of being remotely operated by a mobile terminal reflecting one aspect of the present invention comprises: a specification unit configured to specify an image to be displayed on the mobile terminal as an operation image for the image forming apparatus; an acquisition unit configured to acquire information on the number of display units of the mobile terminal; a decision unit configured to, when a plurality of images is specified as the operation images and the number of the display units of the mobile terminal is recognized as two or more, make a first decision that at least two of the plurality of images are to be displayed on at least two of the two or more display units of the mobile terminal; and a transmission unit configured to transmit a display instruction based on the first decision to the mobile terminal.

(2) To achieve the abovementioned object, according to an aspect, a non-transitory recording medium storing a computer readable program, reflecting one aspect of the present invention, causes a computer built in a mobile terminal capable of operating remotely an image forming apparatus to execute the steps of: a) receiving a display instruction describing that at least two images are to be individually displayed as operation images for the image forming apparatus on at least two of a plurality of display units of the mobile terminal; and b) displaying the at least two images as operation images for the image forming apparatus individually on at least two out of the plurality of display units according to the display instruction.

(3) To achieve the abovementioned object, according to an aspect, an image forming system having an image forming apparatus and a mobile terminal capable of operating remotely the image forming apparatus, reflecting one aspect of the present invention, comprises: a specification unit configured to specify an image to be displayed as an operation image for the image forming apparatus on the mobile terminal; a decision unit configured to, when a plurality of images is specified as the operation images and the number of the display units of mobile terminal is recognized as two or more, make a first decision that at least two of the plurality of images are to be displayed on at least two of the two or more display units of the mobile terminal; and a display control unit configured to display the at least two images on the at least two display units of the mobile terminal.

(4) To achieve the abovementioned object, according to an aspect, a non-transitory recording medium storing a computer readable program, reflecting one aspect of the present invention, causes a computer built in a mobile terminal capable of operating remotely an image forming apparatus to execute the steps of: a) receiving from the image forming apparatus a notification that the number of display target images to be displayed on the mobile terminal as operation images for the image forming apparatus is plural; b) when the notification that the number of the display target images is plural is received and the number of display units of the mobile terminal is two or more, making a first decision that at least two of the plurality of images are to be individually displayed on at least two of the two or more display units of the mobile terminal; and c) displaying the plurality of images according to the first decision.

(5) To achieve the abovementioned object, according to an aspect, an image forming apparatus capable of being remotely operated by a mobile terminal reflecting one aspect of the present invention comprises: a specification unit configured to specify an image to be displayed on the mobile terminal as an operation image for the image forming apparatus; and a transmission unit configured to, when a plurality of images is specified as the operation images, transmit to the mobile terminal a notification that the number

of display target images to be displayed as the operation images on the mobile terminal is plural, so that the mobile terminal decides whether at least two of the operation images are to be individually displayed on at least two of the plurality of display units of the mobile terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, advantages and features of the present invention will become more fully understood from the detailed description given hereinbelow and the appended drawings which are given by way of illustration only, and thus are not intended as a definition of the limits of the present invention, and wherein:

FIG. **1** is a diagram illustrating an image forming system according to a first embodiment;

FIG. **2** is a functional block diagram illustrating an image forming apparatus;

FIG. **3** is a functional block diagram schematically illustrating a configuration of a mobile terminal;

FIG. **4** is a diagram illustrating an example of an operation image displayed on the image forming apparatus;

FIG. **5** is a front view of a mobile terminal having a plurality of display units;

FIG. **6** is a side view of the mobile terminal;

FIG. **7** is a diagram illustrating a mobile terminal having a single display unit;

FIG. **8** is a conceptual diagram illustrating composition of two operation images;

FIG. **9** is a flowchart of operations of the image forming apparatus;

FIG. **10** is a flowchart of operations of the mobile terminal;

FIG. **11** is a timing chart illustrating an example of operations in the image forming system;

FIG. **12** is a flowchart of operations of an image forming apparatus according to a second embodiment;

FIG. **13** is a flowchart of operations of a mobile terminal according to the second embodiment;

FIG. **14** is a timing chart illustrating an example of operations in an image forming system according to the second embodiment;

FIG. **15** is a timing chart illustrating another example of operations;

FIG. **16** is a diagram illustrating functional blocks of the image forming apparatus according to the second embodiment;

FIG. **17** is a diagram illustrating functional blocks of the mobile terminal according to the second embodiment;

FIG. **18** is a diagram illustrating information for generation of a second image;

FIG. **19** is a conceptual diagram illustrating generation of the second image;

FIG. **20** is a flowchart of operations of an MFP according to a third embodiment;

FIG. **21** is a flowchart of operations of a mobile terminal according to the third embodiment;

FIG. **22** is a timing chart illustrating an example of operations in an image forming system according to the third embodiment;

FIG. **23** is a timing chart illustrating another example of operations;

FIG. **24** is a diagram illustrating functional blocks of the mobile terminal according to the third embodiment;

FIG. **25** is a diagram illustrating a display screen of an image forming apparatus according to a modification example;

FIG. **26** is a diagram illustrating display of a composite image on a single display unit of the mobile terminal;

FIG. **27** is a diagram illustrating individual display of two operation images on two display units of the mobile terminal;

FIG. **28** is a diagram illustrating information for generation of a second image; and

FIG. **29** is a conceptual diagram illustrating generation of the second image.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, an embodiment of the present invention will be described with reference to the drawings. However, the scope of the invention is not limited to the illustrated examples.

1. First Embodiment

<1-1. Configuration Outline>

FIG. **1** is a diagram illustrating an image forming system **1** according to a first embodiment. As illustrated in FIG. **1**, the image forming system **1** includes an image forming apparatus **10** and a mobile terminal **50**.

The image forming apparatus **10** and the mobile terminal **50** are connected together via a network **108**. The network **108** is formed by an LAN (local area network), the internet, or the like. The mode of connection to the network **108** may be wired connection or wireless connection. For example, the image forming apparatus **10** is connected to the network **108** in a wired manner and the mobile terminal **50** is connected to the network **108** in a wireless manner.

In the image forming system **1**, various operations can be performed on the image forming apparatus **10** by use of the mobile terminal **50**. That is, the mobile terminal **50** can operate remotely the image forming apparatus **10**. The image forming system **1** is also expressed as a remote operation system for remotely operating the image forming apparatus **10**.

<1-2. Configuration of the Image Forming Apparatus **10**>

FIG. **2** is a diagram illustrating functional blocks of the image forming apparatus **10**. In this example, the image forming apparatus **10** is an MFP (multi-functional peripheral). FIG. **2** illustrates functional blocks of the MFP **10**.

The MFP **10** includes scan function, copy function, facsimile function, box storage function, and others (also called complex machine). Specifically, the MFP **10** includes an image read unit **2**, a print output unit **3**, a communication unit **4**, a storage unit **5**, an operation unit **6**, a controller **9**, and others as illustrated in the functional block diagram of FIG. **2**, and operates these components in combination to implement the various functions.

The image read unit **2** is a processing unit that reads optically (that is, scans) a document placed on the MFP **10** at a predetermined position, and generates image data of the document (also called document image or scanned image). The image read unit **2** is also called scan unit.

The print output unit **3** is an output unit that prints and outputs images on various media such as paper based on data related to a subject to be printed.

The communication unit **4** is a processing unit that can perform facsimile communication via a public line or the like. The communication unit **4** can also perform network communication via the network **108**. For the network communication, various protocols such as TCP/IP (Transmission control Protocol/Internet Protocol) are used, for example.

Through the network communication, the MFP **10** can exchange various data with a desired destination (for example, the mobile terminal **50**).

The communication unit **4** has a transmitter **4***a* transmitting various data and a receiver **4***b* receiving various data.

The storage unit **5** is composed of a storage device such as a hard disc drive (HDD). The storage unit **5** stores data according to a print job.

The operation unit (also called user interface unit) **6** includes an operation input unit **6***a* that accepts inputs into the MFP **10** and a display unit **6***b* that displays various kinds of information. As described next, the operation unit **6** includes a touch panel **25**, hardware keys **210** (**201** to **207** and **211** to **215**), and others.

The MFP **10** is provided with an approximately plate-like operation panel unit **6***c* (see FIG. **1**) as the operation unit **6**.

The operation panel unit **6***c* has the touch panel **25** (see FIG. **1**) on the front side. The touch panel **25** is formed by embedding piezoelectric sensors and others into a liquid crystal display panel, and can display various kinds of information and accept operation inputs from an operator. For example, the touch panel **25** displays menu images (including button images and others). The operator can press buttons (buttons expressed by button images) virtually arranged in the touch panel **25** to set the contents of various operations to be performed by the image forming apparatus **10**. The touch panel **25** serves as not only the operation input unit **6***a* but also the display unit **6***b*.

The operation panel unit **6***c* is provided with a plurality of hardware keys **210** (**201** to **207** and **211** to **215**). For example, as illustrated in FIG. **4**, the operation panel unit **6***c* is provided with the plurality of hardware keys **210** such as a power key (sub-power key) **201**, a start key **205**, a stop key **206**, a reset key **207**, a menu key **211**, a guide key **212**, an ID key **213**, an interrupt key **214**, and a preview key **215**. These hardware keys **210** are also expressed as operation input units (operation input unit accepting operation inputs from the operator) provided separately from the touch panel **25**.

The controller **9** is a control device that is built in the MFP **10** to perform centralized control of the MFP **10**. The controller **9** is formed as a computer system including a CPU, various semiconductor memories (RAM and ROM), and others. The controller **9** implements various processing units by executing predetermined software programs (hereinafter, also referred to simply as programs) stored in the ROM (for example, EEPROM) by the CPU. The programs (specifically, program module groups) may be recorded in portable recording media such as USB memories and installed into the MFP **10** via the recording media, or may be installed into the MFP **10** via the network **108** or the like.

Specifically, as illustrated in FIG. **2**, the controller **9** executes the programs to implement various processing units including a communication control unit **11**, an input control unit **12**, a display control unit **13**, an acquisition unit **14**, a specification unit **15**, a decision unit **16**, and an image preparation unit **18**.

The communication control unit **11** is a processing unit that controls communication with other devices (the mobile terminal **50** and others). For example, the communication control unit **11** receives from the mobile terminal **50** operation input information as information related to operation inputs from the operator for a remote operation image displayed on the mobile terminal **50**.

The input control unit **12** is a control unit that controls operation inputs into the operation input unit **6***a* (the touch panel **25** and others). For example, the input control unit **12** controls operations of accepting operation inputs into the operation screen displayed on the touch panel **25**.

The display control unit **13** is a processing unit that controls display on the display unit **6***b* (the touch panel **25** and others).

The acquisition unit **14** is a processing unit that acquires information on the number of display units of the mobile terminal **50**. The acquisition unit **14** acquires information on the number of display units of the mobile terminal **50** through communication with the mobile terminal **50**, for example.

The specification unit **15** is a processing unit that specifies the image to be displayed on the mobile terminal **50** as an operation image (remote operation image) at the image forming apparatus **10**.

The decision unit **16** is a processing unit that decides how to display the operation image on the display unit of the mobile terminal **50**. For example, the decision unit **16** decides whether to display two images individually on two different display units of the mobile terminal **50**.

The image preparation unit **18** is a processing unit that prepares the image to be displayed as a remote operation image.

<1-3. Configuration of the Mobile Terminal **50**>

Next, a configuration of the mobile terminal (also called remote operation device) **50** will be described.

The mobile terminal **50** is an information input/output terminal device capable of network communication with other devices. In this example, the mobile terminal **50** is a tablet terminal. However, the mobile terminal **50** is not limited to this but the mobile terminal **50** may be a smartphone, a personal computer or the like.

FIG. **3** is a functional block diagram schematically illustrating a configuration of the mobile terminal **50**.

As illustrated in the functional block diagram of FIG. **3**, the mobile terminal **50** includes a communication unit **54**, a storage unit **55**, an operation unit **56**, a controller **59**, and others, and operates these components in combination to implement various functions.

The communication unit **54** is capable of network communication via the network **108**. In the network communication, various protocols such as TCP/IP (Transmission Control Protocol/Internet Protocol) are used. Through the network communication, the mobile terminal **50** can exchange various data with desired opposing sides (the image forming apparatus **10** and others). The communication unit **54** has a transmitter **54***a* transmitting various data and a receiver **54***b* receiving various data.

The storage unit **55** is composed of a storage device such as a non-volatile semiconductor memory. The storage unit **55** stores temporarily various image data (display data for remote operation screen) transmitted from the MFP **10**, for example.

The operation unit **56** includes an operation input unit **56***a* that accepts inputs into the mobile terminal **50** and a display unit **56***b* that displays various kinds of information.

The mobile terminal **50** is provided with two touch panels **75** and **77** (see FIG. **1**) formed by embedding piezoelectric sensors and others into liquid crystal display panels. Specifically, the touch panel **75** is provided on the front surface of the approximately plate-like mobile terminal **50** at the central portion excluding the outer edge portion (frame portion). The touch panel **77** is provided in the approximately rectangular mobile terminal **50** near a portion corresponding to one long side of the outer edge portion. At the outer edge portion (corresponding to the one long side) of the mobile terminal **50**, inclined portions are provided by

cutting and rounding the corners of the front surface, and the touch panel **77** is provided at the inclined portions. The touch panel **77** can be viewed from not only the front side of the mobile terminal **50** but also the lateral sides of the mobile terminal **50**.

Each of these touch panels **75** and **77** serves as operation input unit **56***a* and display unit **56***b*. The touch panel **75** displays the remote operation screen (operation image) described above and accepts operation inputs into the remote operation screen, for example. The touch panel **77** also displays hardware key images and others as operation images and accepts operation inputs into the hardware key images and others as described later, for example.

The controller **59** is a control device that is built in the mobile terminal **50** to perform centralized control of the mobile terminal **50**. The controller **59** is formed as a computer system including a CPU, various semiconductor memories (RAM and ROM), and others. The controller **59** implements various processing units by executing predetermined software programs (hereinafter, also referred to simply as programs) stored in the storage unit (a semiconductor memory or the like) by the CPU. The programs (specifically, program module groups) may be recorded in portable recording media such as USB memories and installed into the mobile terminal **50** via the recording media, or may be installed into the mobile terminal **50** via the network **108** or the like.

The programs are application software programs for remotely operating the image forming apparatus **10** and implementing several functions related to remote operations, for example.

Specifically, the controller **59** executes the programs to implement various processing units including a communication control unit **61** and an input/output control unit **65**.

The communication control unit **61** is a processing unit that controls communication with the image forming apparatus **10** and others in cooperation with the communication unit **54** and others.

An input control unit **62** is a control unit that controls operation inputs into the operation input unit **56***a* (the touch panels **75**, **77**, and others). For example, the input control unit **62** controls the operation of accepting operation inputs into the operation screen displayed on the touch panels **75** and **77**.

A display control unit **63** is a processing unit that controls display on the display unit **56***b* (the touch panels **75**, **77**, and others). For example, the display control unit **63** controls display on the touch panels **75** and **77**.

<1-4. Operation Screen Displayed on MFP>

FIG. **4** is a diagram illustrating an example of an operation image **200** displayed on the MFP **10**. As illustrated in FIG. **4**, the touch panel **25** of the MFP **10** displays an operation image **220** (**220***a*) for making settings related to copy function, for example.

The operation image **220***a* has a key (button) arrangement field **230** at the inside lower part. A plurality of (seven in FIG. **4**) software key images (hereinafter, also referred to simply as software keys) **250** is arranged in the key arrangement field **230**. More specifically, a predetermined number (seven in this example) software keys selected from among a large number of (for example, 20) software keys is displayed in the key arrangement field **230**. When a flick operation (for example, a left-and-right flick operation) is performed in the key arrangement field **230**, the software keys displayed in the key arrangement field **230** are changed.

The operator of the MFP **10** presses (for example, performs a single tap on) one of the plurality of software keys displayed in the key arrangement field **230** to call a screen for making detailed settings corresponding to the software key to make more detailed settings.

<1-5. Remote Operation Screen Displayed on the Mobile Terminal>

The MFP **10** is capable of being remotely operated through the mobile terminal **50**. In this embodiment, for remote operation of the MFP **10** through the mobile terminal **50**, the same image as the operation image **220***a* is displayed on the mobile terminal **50** to accept an instruction from the user.

To implement through remote operation the same instruction as the instruction given by use of the hardware keys of the MFP **10**, the hardware key images corresponding to the hardware keys of the MFP are also displayed on the mobile terminal **50** to accept the instruction from the user.

In this embodiment, however, remote operation screens (operation images) are displayed on the mobile terminal **50** according to the number of touch panels (display units) of the mobile terminal **50**.

Specifically, when the mobile terminal **50** has two touch panels, two different operation images **300** (**320** and **340**) are displayed on the mobile terminal **50**. For example, as illustrated in FIG. **5**, when a mobile terminal **50***a* has two touch panels **75** and **77**, two different operation images **320** (**320***a*) and **340** (**340***a*) are displayed on the mobile terminal **50***a*. FIG. **5** is a front view of the mobile terminal **50***a*. FIG. **5** illustrates the operation image **320***a* (first image) displayed on the touch panel **75** of the mobile terminal **50***a* and the other operation image **340***a* (second image) on the other touch panel **77** of the mobile terminal **50***a*. FIG. **6** is a side view of the mobile terminal **50***a*. FIG. **6** illustrates the state in which the operation image **340***a* is displayed on the touch panel **77**.

In this example, the operation image **340***a* is an image having a plurality of hardware key images **310** (**341** to **350**) (see FIG. **6** and others). The plurality of hardware key images **310** corresponds to the plurality of hardware keys **210** provided at the operation unit **6** of the MFP **10**. For example, the hardware key image **341** corresponds to the power key (sub-power key) **201**. The hardware key images **342**, **343**, **344**, **345**, and **346** correspond to the menu key **211**, the guide key **212**, the ID key **213**, the interrupt key **214**, and the preview key **215**, respectively. The hardware key images **348**, **349**, and **350** correspond to the start key **205**, the stop key **206**, and the reset key **207**, respectively. The hardware key image **347** corresponds to a numeric keypad provided at the operation unit of the MFP **10**. The numeric keypad is hidden behind the touch panel **25** of the MFP **10**, for example. The numeric keypad appears by sliding a slide member (with the touch panel **25**) of the operation unit **6**.

When one of the plurality of hardware key images **341** to **350** is pressed (for example, tapped once), it is determined that the same instruction as the instruction given by the press of the hardware key corresponding to the key image is provided. That is, the user of the mobile terminal **50** can provide the same instruction as the instruction given with the hardware key **210** of the MFP, through remote operation with the hardware key image **310** (**341** to **350**).

As in the foregoing, when the mobile terminal **50** (for example, **50***a*) has the two touch panels **75** and **77**, the two touch panels **75** and **77** display individually the two different operation images **320** and **340**.

Meanwhile, the mobile terminal **50** (for example, **50***b*) has only the touch panel **75**, a composite image of the two operation images **320** and **340** is displayed as a remote operation screen (operation image) on the mobile terminal

50. FIG. 7 illustrates an operation image 360 (360*a*) according to the composite image on the mobile terminal 50*b* having the single display unit (touch panel 75). The operation image (composite image) 360 (360*a*) is formed by compositing the two operation images 320 (320*a*) and 340 (340*a*) (see FIG. 8). FIG. 8 illustrates the state in which the two operation images 320 and 340 are composited to generate the operation image 360.

According to this mode, when the mobile terminal 50*a* has the two touch panels 75 and 77, the two operation images 320*a* and 340*a* are individually displayed on the two touch panels 75 and 77 (see FIG. 5 and others). The operation image 340 is not superimposed on the operation image 320 on the touch panel 75, and it is possible to suppress degradation in visibility resulting from the superimposition.

In particular, as compared to the case where the operation image 360 according to the composite image (see FIG. 7) is constantly displayed regardless of the number of the display units of the mobile terminal 50, it is possible to use effectively the plurality of display units of the mobile terminal.

According to this embodiment, it is possible to use effectively the plurality of touch panels 75 and 77 of the mobile terminal 50 and suppress degradation in visibility resulting from the superimposition.

This mode will be further described below in detail.

<1-6. Operations>

FIG. 9 is a flowchart of operations of the MFP 10. FIG. 10 is a flowchart of operations of the mobile terminal 50. FIG. 11 is a timing chart illustrating an example of operations in the image forming system 1.

After communication connection is established between the MFP 10 and the mobile terminal 50 and a login operation or the like is performed, at step S11, the MFP 10 specifies the image to be displayed (display target image) on the mobile terminal 50 as the operation image (remote operation screen) of the MFP 10, based on the operation image 220 and others displayed on the touch panel 25.

It is assumed here that the operation image 220*a* as illustrated in FIG. 4 is displayed on the touch panel 25 of the MFP 10. In this case, the MFP 10 first decides the same image 320*a* (see FIG. 5) as the operation image 220*a* as the operation image to be displayed on the mobile terminal 50. In other words, the MFP 10 first decides the image 320*a* (identical to the image 220*a*) (see FIG. 5) corresponding to the operation screen (operation image) 220*a* displayed on the operation unit 6 (specifically, the touch panel 25) of the MFP 10 as the operation image to be displayed on the mobile terminal 50. Further, the MFP 10 also decides the image 340 (340*a*) (see FIG. 6) as the operation image to be displayed on the mobile terminal 50. The image 340*a* includes the plurality of hardware key images 341 to 350. As described above, the plurality of hardware key images 341 to 350 corresponds to the plurality of hardware keys in the operation unit 6 of the MFP 10.

In this manner, the MFP 10 specifies the plurality of images (including the two operation images 320 and 340) as the operation images.

At step S12, the MFP 10 communicates with the mobile terminal 50 to acquire information related to the display units of the mobile terminal 50 (the number of the display units (for example, two units) and the number of pixels (for example, 1200×800 pixels) of the display units). More specifically, the mobile terminal 50 transmits the information to the MFP 10 (step S51 (see FIG. 10)), and the MFP 10 receives and acquires the information from the mobile terminal 50.

At step S13, the MFP 10 decides the display mode ("individual display"/"composite display" (described later)) of the connected mobile terminal 50, based on the results of the specification at step S11 and the information acquired at step S12 (more specifically, the information on the number of the display units of the mobile terminal 50). Then, the MFP 10 notifies the decision to the mobile terminal.

Specifically, when two images (for example, 320 and 340) are specified as operation images at step S11 and the number of the display units of the mobile terminal 50 is recognized as two or more, the MFP 10 decides that the two images are to be individually displayed on two display units (for example, 75 and 77) of the plurality of display units of the mobile terminal 50 ("individual display"). More specifically, the MFP 10 decides that the operation image 320 is to be displayed on the touch panel 75 and the operation image 340 is to be displayed on the touch panel 77, based on the sizes (the numbers of pixels) of the two operation images 320 and 340 and the sizes (the numbers of pixels) of the touch panels 75 and 77. In other words, the MFP 10 decides that, out of the two images 320 and 340, the relatively large operation image 320 is to be displayed on the touch panel 75 (out of the two touch panels 75 and 77, the relatively large touch panel), and the operation image 340 (the relatively small image) smaller than the operation image 320 is to be displayed on the touch panel 77 (the relatively small display unit) smaller than the touch panel 75. Then, the MFP 10 transmits a display instruction describing the decision (notification of decision) to the mobile terminal 50.

When two images are specified as operation images at step S11 and the mobile terminal 50 is recognized as having only one display unit, the MFP 10 decides that the composite image 360 of the two images 320 and 340 is to be displayed on the single display unit (for example, the touch panel 75) of the mobile terminal 50 ("composition display"). Then, the MFP 10 transmits a display instruction describing the decision (notification of decision) to the mobile terminal 50.

In addition, when the mobile terminal 50 has three display units (touch panels 75, 77, and 79 (not illustrated)) and two images are specified as display target images (operation images), the MFP 10 may decide that the two images are to be individually displayed on two display units (touch panels 75 and 77) out of the plurality of display units of the mobile terminal 50. At that time, one of the two images may be displayed on the remaining display unit (touch panel 79). For example, the MFP 10 may decide that the operation image 320 is to be displayed on the touch panel 75 and the operation image 340 is to be displayed on both the touch panels 77 and 79. Alternatively, the MFP 10 may determine that a composite image of the two images is to be displayed on the remaining display unit (touch panel 79) or none of the images is to be displayed on the remaining display unit (touch panel 79).

At step S14, the MFP 10 performs a branched process based on the result of the decision at step S13.

When deciding that "composition display" (also called composite display decision) is to be performed, the MFP 10 moves the process from step S14 to step S21. At step S21, the MFP 10 generates the composite image 360 of the two images 320 and 340, and transmits the composite image 360 to the mobile terminal 50 (for example, 50*b*). The mobile terminal 50 (50*b*) determines at step S52 (see FIG. 10) that the mobile terminal 50 has the single display unit, and moves to step S61. Then, the mobile terminal 50 receives from the MFP 10 the result of the decision that "composite display" is to be performed and the composite image 360

(360*a*) (step S61). Accordingly, as illustrated in FIG. 7, the composite image 360 (360*a*) is displayed on the touch panel 75 (step S62).

In contrast, when deciding that "individual display" is to be performed (also called individual display decision), the MFP 10 moves the process from step S14 to step S16. At step S16, the MFP 10 prepares two images 320 and 340 and transmits the two operation images 320 and 340 to the mobile terminal 50 (for example, 50*a*). In this example, the operation images 320 and 340 are stored in advance in the storage unit 5 of the MFP 10, and the MFP 10 prepares the same by extracting from the storage unit 5.

The mobile terminal 50 (for example, 50*a*) determines at step S52 (see FIG. 10) that the mobile terminal 50 has a plurality of display units, and moves from step S52 to step S53. The mobile terminal 50 receives from the MFP 10 the result of the decision that "individual display" is to be performed and the two images 320 and 340 (step S53 (see FIGS. 10, 11, and others)), and displays the two images 320 and 340 individually on the touch panels 75 and 77 (step S57). Specifically, as illustrated in FIG. 5, the MFP 10 displays the operation image 320 (320*a*) on the touch panel 75 and displays the operation image 340 (340*a*) on the touch panel 77 (step S57).

After that, the mobile terminal 50 accepts a user operation on the touch panels 75 and 77, and transmits the contents of the operation to the MFP 10. More specifically, the mobile terminal 50 transmits to the MFP 10 the information indicating on which of the operation images 320 and 340 the operation was performed and the coordinate information on the position of the operation (pressed position). The coordinate information is preferably transmitted after the MFP 10 performs a coordinate conversion process on the coordinate system. The MFP 10 comprehends the contents of the remote operation by the mobile terminal 50 based on the received information and executes a process corresponding to the contents of the remote operation.

According to the foregoing mode, when a plurality of images including the two images 320 and 340 is specified as operation images and the mobile terminal 50 has two or more display units, the MFP 10 transmits a display instruction for individual display to the mobile terminal 50. Specifically, the MFP 10 transmits a display instruction for displaying the two operation images 320 and 340 individually on two different touch panels (display units) 75 and 77 out of the plurality of display units of the mobile terminal 50. In response to the display instruction, the two operation images 320 and 340 are displayed individually on the two touch panels 75 and 77. The operation image 340 is not superimposed on the operation image 320 on the touch panel 75, and it is possible to suppress degradation in visibility resulting from the superimposition. It is also possible to use effectively the plurality of display units of the mobile terminal 50.

2. Second Embodiment

In the first embodiment, both the operation image 320 and the operation image 340 are always prepared at the MFP 10, but the present invention is not limited to this. For example, the operation image 340 may be generated and prepared by the mobile terminal 50 immediately before the transmission at step S16. Alternatively, the device to prepare the operation image 340 may be changed in a determination process under a predetermined criterion. When the mobile terminal 50 is to prepare the operation image 340, information for generating the operation image 340 at the mobile terminal 50 may be transmitted from the MFP 10 to the mobile terminal 50 as described later.

In relation to a second embodiment, the mode in which the MFP 10 determines the device to prepare the operation image 340 (second image) will be described in detail. In the second embodiment, the MFP 10 decides the device to prepare the operation image 340 based on the speed of network communication (network communication speed) between the MFP 10 and the mobile terminal. Hereinafter, the differences of this mode from the first embodiment will be mainly described.

FIG. 12 is a flowchart of operations of the MFP 10 according to the second embodiment. FIG. 13 is a flowchart of operations of the mobile terminal 50 according to the second embodiment. FIG. 14 is a timing chart illustrating an example of operations (when the MFP 10 prepares the operation image 340) in the image forming system 1 according to the second embodiment. FIG. 15 is a timing chart illustrating another example of operations (when the mobile terminal 50 prepares the operation image 340). FIG. 16 is a diagram illustrating functional blocks of the MFP 10 according to the second embodiment. FIG. 17 is a diagram illustrating functional blocks of the mobile terminal 50 according to the second embodiment. As illustrated in FIG. 16 and FIG. 17, in the second embodiment, the MFP 10 further includes a determination unit 17, and the mobile terminal 50 further includes an image preparation unit 68.

Referring to FIG. 12, steps S15 to S17 are different from the corresponding steps described in FIG. 9, and referring to FIG. 13, steps S54 to S56 are different from the corresponding steps described in FIG. 10.

The MFP 10 (determination unit 17 (see FIG. 16)) determines at step S15 described in FIG. 12 which of the MFP 10 and the mobile terminal 50 to prepare the operation image 340. In this example, the MFP 10 determines which of the devices to prepare the operation image 340 based on the status of the network (the speed of network communication between the MFP 10 and the mobile terminal). More specifically, when the speed of network communication between the MFP 10 and the mobile terminal is higher than a predetermined level (in other words, when communication can be performed between the MFP 10 and the mobile terminal 50 at a higher speed than a predetermined level), the MFP 10 determines that the MFP 10 itself is to prepare the operation image 340. In contrast, when the network communication speed is lower than the predetermined level (in other words, when communication can be performed between the two devices 10 and 50 at a lower speed than the predetermined level), the MFP 10 decides that the mobile terminal 50 is to prepare the operation image 340.

When determining that the MFP 10 itself is to prepare the operation image 340, the MFP 10 moves to step S16. The operation at step S16 is the same as that in the first embodiment. At step S16, the MFP 10 transmits the pre-generated operation images 320 and 340 to the mobile terminal 50 (see also FIG. 14). In this case, step S17 is not performed or no request for preparation of the operation image 340 is transmitted to the mobile terminal.

The mobile terminal 50 receives the operation images 320 and 340 from the MFP 10 in the loop process (receiving process) at steps S54 to S56 (step S56), and displays the operation image 320 on the touch panel 75 and displays the operation image 340 on the touch panel 77 as illustrated in FIG. 5 and others (step S57). In this case, no request for preparation of the operation image 340 is received or step S55 (described later) is not executed (in response to comple-

tion of receipt of the operation image **320**). The MFP **10** moves the process to step S**57**.

In contrast, when determining that the mobile terminal **50** is to prepare the operation image **340**, the MFP **10** moves from step S**15** to step S**17**. At step S**17**, the MFP **10** transmits only the operation image **320** out of the two operation images **320** and **340** to the mobile terminal **50**, and also transmits a request for preparation of the other operation image **340** to the mobile terminal **50**. At that time, the MFP **10** preferably transmits the request for preparation of the operation image **340** to the mobile terminal **50** prior to the transmission of the operation image **320**, so that the mobile terminal **50** can start to generate the operation image **340** at a relatively early stage (see FIG. **15**).

Upon receipt of the request for preparation of the operation image **340** in the loop process (receiving process) at steps S**54** to S**56**, the mobile terminal **50** determines at step S**54** that the request for preparation of the operation image **340** has been received, and then moves to step S**55**. The mobile terminal **50** executes in parallel the process for receiving the operation image **320** and a process for generating the operation image **340** (step S**55**) described next.

At step S**55**, the mobile terminal **50** (specifically, image preparation unit (also called image generation unit) **68** (see FIG. **17**)) executes the process for preparation (generation) of the operation image **340** according to the request for preparation of the operation image **340**. The request for preparation includes information for preparation of the operation image **340** (information for generation of the second image), and the information for generation includes various kinds of information for use in generation of the operation image **340**. As illustrated in FIG. **18**, the information for generation includes information related to element IDs, positions (X, Y), sizes (W (width) and H (height)) and others of a plurality of item elements (in this example, image elements (the plurality of hardware key images **341** to **350** included in the operation image **340**)). The positions and sizes are information related to the operation image **340** of a basic size.

The mobile terminal **50** stores in advance in the storage unit **55** a model image (template image) **370** and a plurality of component images **371** **372**, **373**, . . . for the operation image **340**. The model image (template image) **370** (see FIG. **19**) is image data defining the outer shape and others of the operation image **340**, and the plurality of component images **371**, **372**, **373**, . . . (see FIG. **19**) are image data of component elements. In response to the request for preparation, the mobile terminal **50** extracts the element IDs from the information for generation included in the request for preparation, and extracts the component images corresponding to the element IDs from the storage unit **55**. The mobile terminal **50** also adjusts the positions and the sizes of the component images based on the position information (X, Y) and the size information (W and H) included in the information for generation, the ratio of the basic size of the operation image to the size of the touch panel **77** (the number of pixels), and others, and superimposes the component images on the template image. More specifically, the mobile terminal **50** arranges horizontally the plurality of component images (hardware key images) **371**, **372**, **373**, . . . corresponding to the plurality of item elements (item elements for selection) on the template image **370** to generate the operation image **340**. In this manner, the mobile terminal **50** prepares the operation image **340**.

When determining at step S**56** that the process for preparation of the operation image **340** (step S**55**) is completed and the receipt of the operation image **320** is completed, the mobile terminal **50** moves to step S**57**. At step S**57**, the mobile terminal **50** displays the operation image **320** on the touch panel **75** and displays the operation image **340** on the touch panel **77** (see FIG. **5**). The operation image **340** illustrated in FIG. **19** is the same in height as the touch panel **77** and is wider than the touch panel **77**. The touch panel **77** displays part of the operation image **340** (a display target area (shown by thick broken lines in FIG. **19**)) in the width direction. In other words, the touch panel **77** displays selectively few of the relatively large number of item elements. Accordingly, the item elements can be displayed in a relatively large size on the touch panel **77**. The target display area of the operation image **340** can be changed according to the user's horizontal (right-and-left) flick operation. That is, the operation image **340** can be horizontally scrolled on the touch panel **77**. The user can display desired item elements on the touch panel **77** through the scroll operation.

According to the foregoing operation, the device to prepare the operation image **340** is changed according to the network communication speed, which allows flexible responses to the communication status. In particular, when it is determined that communication can be performed between the MFP **10** and the mobile terminal **50** at a lower speed than a predetermined level, the MFP **10** transmits the information for generation to the mobile terminal **50**, and the mobile terminal **50** prepares the operation image **340** based on the information for generation. The information for generation has a smaller data capacity than the operation image **340**. Therefore, as compared to the case where the operation image **340** itself is transmitted, it is possible to prevent the data transmission time from becoming longer due to reduction in the network communication speed, and prepare the operation image **340** at an earlier stage. Accordingly, it is possible to display the operation image **340** on the mobile terminal **50** at a relatively early stage and suppress degradation in operability.

3. Third Embodiment

In the first and second embodiments, the MFP **10** decides whether to perform "individual display" or "composite display" on the mobile terminal **50**, but the present invention is not limited to this. Alternatively, the mobile terminal **50** may decide whether to perform "individual display" or "composite display" on the mobile terminal **50**.

In the second embodiment, the MFP **10** decides the device to prepare the operation image **340**, but the present invention is not limited to this. The mobile terminal **50** may decide the device to prepare the operation image **340**.

In relation to a third embodiment, the mode with these modifications will be described. Hereinafter, the differences from the second embodiment will be mainly described.

FIG. **20** is a flowchart of operations of the MFP **10** according to the third embodiment. FIG. **21** is a flowchart of operations of the mobile terminal **50** according to the third embodiment. FIG. **22** is a timing chart illustrating an example of operations (when the MFP **10** prepares the operation image **340**) in the image forming system **1** according to the third embodiment. FIG. **23** is a timing chart illustrating another example of operations (when the mobile terminal **50** prepares the operation image **340**). FIG. **24** is a diagram illustrating functional blocks of the mobile terminal **50** according to the third embodiment. The MFP **10** according to the third embodiment has the same functional blocks as those of the MFP **10** according to the first embodiment (see FIG. **2**). However, the MFP **10** does not need to be

provided with the decision unit **16**. A decision unit **66** of the mobile terminal **50** executes the same process as the process performed by the decision unit **16**.

The process flow described in FIG. **20** is different from the process flow described in FIG. **12** in that steps S**32** and S**33** are executed instead of steps S**12** and S**13**, and steps S**35** to S**39** are executed instead of steps S**15** to S**17**.

The process flow described in FIG. **21** is different from the process flow described in FIG. **13** in that steps S**71** to S**76** are executed instead of steps S**51** to S**56**.

As described in FIG. **20**, the MFP **10** specifies the operation image to be displayed as the remote operation image of the MFP **10** on the mobile terminal **50** (step S**11**), and then notifies the specification to the mobile terminal **50** (step S**32**).

For example, when specifying the two operation images **320** and **340** as operation images, the MFP **10** notifies the mobile terminal **50** that the number of the images to be displayed (display target images) as operation images on the mobile terminal **50** is plural. More specifically, the MFP **10** notifies the mobile terminal **50** that the number of the display target images is plural to allow the mobile terminal **50** to decide whether to display the two images individually on two display units out of the plurality of display units of the mobile terminal **50**.

Upon receipt of the information on the number of the display target images from the MFP **10** at steps S**71** (see FIG. **21**), the mobile terminal **50** decides whether the mobile terminal is to perform "individual display" or "composite display" based on the number of the display units of the mobile terminal **50** and the number of the display target images. The decision process is performed by the decision unit **66** of the mobile terminal **50** (see FIG. **24**) or the like.

When the number of the display unit of the mobile terminal **50** is one and the number of the display target images is two, for example, the mobile terminal **50** decides that the composite image of the two images is to be displayed on the single display unit of the mobile terminal **50**. Shortly, the mobile terminal **50** decides that "composite display" is to be performed. After that, the mobile terminal **50** notifies the result of the decision to the MFP **10**. In this case, the mobile terminal **50** moves from step S**72** to steps S**61** and S**62**. Then, the mobile terminal **50** performs the same process as the foregoing process at steps S**61** and S**62**.

When the number of the display units of the mobile terminal **50** is two or more and the number of the display target images is two, the mobile terminal **50** decides that the two images are to be displayed individually on two different display units out of the plurality of display units of the mobile terminal **50**. Shortly, the mobile terminal **50** decides that "individual display" is to be performed. Then, the mobile terminal **50** notifies the result of the decision to the MFP **10**. In this case, the mobile terminal **50** moves from step S**72** to step S**73**.

At steps S**73** to S**76**, the mobile terminal **50** acquires the two display target images (operation images **320** and **340**) (specifically, the image data) based on the decision ("individual display").

More specifically, at step S**73**, the mobile terminal **50** first determines which of the MFP **10** and the mobile terminal **50** is to prepare the operation image **340** out of the two operation images **320** and **340** based on the speed of network communication between the mobile terminal **50** and the MFP **10**. The determination process is executed by the determination unit **67** of the mobile terminal **50** (see FIG. **24**) or the like. The determination method is the same as that in the second embodiment. Specifically, when the network communication speed is higher than a predetermined level, the MFP **10** is determined to prepare the operation image **340**, and when the network communication speed is lower than the predetermined level, the mobile terminal **50** is determined to prepare the operation image **340**.

When determining that the MFP **10** is to prepare the operation image **340**, the mobile terminal **50** transmits a request for transmission of the operation image **340** to the MFP **10** (step S**74**), and receives the operation image **340** (specifically, the image data) from the MFP **10**.

In contrast, when determining that the mobile terminal **50** is to prepare the operation image **340**, the mobile terminal **50** generates the operation image **340** based on the information for generation (step S**75**). More specifically, the mobile terminal **50** first transmits a request for transmission of the information for generation of the operation image **340** to the MFP **10**, and receives the information for generation from the MFP **10**, and then generates the operation image **340** based on the information for generation. For example, the mobile terminal **50** generates the image in which a plurality of item elements included in the information for generation is arranged in a predetermined direction as the operation image **340**.

Referring again to FIG. **20**, the response operations of the MFP **10** will be described.

Upon receipt of the notification of the decision on whether "individual display" or "composite display" is to be performed (step S**71**) from the mobile terminal **50** at step S**33**, the MFP **10** moves to the branched process at step S**14**.

When receiving the result of the decision that "composite display" is to be performed, the MFP **10** moves from step S**14** to step S**21**, and transmits the composite image **360** to the mobile terminal **50** (step S**21**). After that, as described above, the mobile terminal **50** receives the composite image **360** (step S**61**), and displays the composite image **360** on the touch panel **75** (step S**62**).

In contrast, when receiving the result of the decision that "individual display" is to be performed, the MFP **10** moves from step S**14** to step S**35**, and first starts the transmission of the operation image **320** (first image) (also see FIGS. **22** and **23**).

After that, regarding the operation image **340** (second image), the MFP **10** performs the branched process depending on whether which of the request for transmission of the operation image **340** or the request for transmission of the information for generation of the operation image **340** has been received (step S**36**).

When the request for transmission of the information for generation of the operation image **340** has been received, the MFP **10** transmits the information for generation to the mobile terminal **50** (step S**39**) (also see FIG. **23**).

In contrast, when the request for transmission of the operation image **340** has been received, the MFP **10** prepares the operation image **340** (step S**37**) and transmits the operation image **340** (step S**38**) (also see FIG. **22**).

Referring again to FIG. **21**, when determining at step S**76** described in FIG. **21** that the receipt of the operation image **320** is completed and the receipt of the operation image **340** or the generation of the operation image **340** is completed, the mobile terminal **50** moves to step S**57**. At step S**57**, the mobile terminal **50** displays the two operation images **320** and **340** individually on the touch panels **75** and **77**. More specifically, the mobile terminal **50** displays the operation image **320** on the touch panel **75** and displays the operation image **340** on the touch panel **77**.

By the foregoing operations, the same advantages as those of the second embodiment can be obtained.

In the third embodiment, the mobile terminal **50** decides whether "individual display" or "composite display" is to be performed on the mobile terminal, and also decides the device to prepare the operation image **340**. However, the present invention is not limited to this.

For example, the mobile terminal **50** may decide whether "individual display" or "composite display" is to be performed on the mobile terminal **50**, whereas the MFP **10** may decide the device to prepare the operation image **340**. More specifically, referring to the flowchart of FIG. **20**, steps S**15** to S**17** (see FIG. **12**) may be executed instead of steps S**35** to S**39**, and referring to the flowchart including step S**71** and others of FIG. **21**, steps S**54** to S**56** (see FIG. **13**) may be performed instead of steps S**73** to S**76**.

Alternatively, the MFP **10** may decide whether "individual display" or "composite display" is to be performed on the mobile terminal **50**, whereas the mobile terminal **50** may decide the device to prepare the operation image **340**. More specifically, referring to the flowchart including step S**13** and others of FIG. **12**, steps S**35** to S**39** (see FIG. **20**) may be executed instead of steps S**15** to S**17**, and referring to the flowchart of FIG. **13**, steps S**73** to S**76** (see FIG. **21**) may be performed instead of steps S**54** to S**56**.

In addition, in the third embodiment, the MFP **10** receives the result of the decision by the mobile terminal **50** (step S**33**), and then transmits the information on the two operation images **320** and **340** (steps S**35** to S**39**). However, the present invention is not limited to this. For example, the MFP **10** may transmit the information on the two operation images **320** and **340** prior to the decision process (step S**71**) by the mobile terminal **50**. The information on the two operation images **320** and **340** may include the image data of the operation image **320** and the image data of the operation image **340**, or may include the image data of the operation image **320** and the information for generation of the operation image **340**.

4. Others

The embodiments of the present invention have been described so far. However, the present invention is not limited to the contents described above.

For example, in the second embodiment and others, the operation image **340***a* is generated by the mobile terminal **50**. However, the present invention is not limited to this. The operation image **340***a* may be generated by the MFP **10**, not by the mobile terminal **50**. More specifically, at steps S**16** (see FIG. **12**) and S**37** (see FIG. **20**), the operation image **340***a* may be generated by the MFP **10** according to the same method as step S**55** or the like.

In the foregoing embodiments, the operation images **320***a* and **340***a* are exemplified as two different operation images **320** and **340**. Specifically, the image **320***a* (see FIG. **5**) corresponding to the operation image **220***a* (see FIG. **4**) displayed on the operation unit **6** (specifically, the touch panel **25**) of the MFP **10** is exemplified as first image. In addition, the image **340***a* (see FIGS. **5** and **6**) including the plurality of hardware key images **310** (**341** to **350**) corresponding to the plurality of hardware keys **210** (see FIG. **4**) provided on the operation unit **6** of the MFP **10** is exemplified as second image. Further, the image **360***a* is exemplified as composite image **360** of the two images.

However, the present invention is not limited to this. The two different operation images **320** and **340** may be operation images **320***b* and **340***c* as illustrated in FIG. **27** or the like. The operation image **320***b* is a preview image corresponding to (and identical to) a preview display screen **220***b* (see FIG. **25**) displayed on the operation unit **6** (the touch panel **25**) of the MFP **10** (at the time of a scanning process). The operation image **340***c* is an image related to a pop-up screen **240***b* (see FIG. **25**) superimposed on the preview display screen **220***b* on the operation unit **6** (the touch panel **25**) of the MFP **10**. The operation image **340***c* has the same item elements as the item elements on the pop-up screen **240***b* (see FIG. **25**). The operation image **340***c* can be used to make selections as if making selections on the pop-up screen **240***b*.

When a plurality of images including the operation images **320***b* and **340***c* is specified as operation images and the number of the display units of the mobile terminal **50** is two or more, the operation image **320***b* may be displayed on the touch panel **75** and the operation image **340***c* may be displayed on the touch panel **77** (see FIG. **27**).

When a plurality of images including the operation images **320***b* and **340***c* is specified as operation images and the number of the display unit of the mobile terminal **50** is one, a composite image **360***b* of the operation image **320***b* and the operation image **340***c* may be displayed on the touch panel **75** (see FIG. **26**). The composite image **360***b* is an image (composite image) formed by compositing the operation image **320***b* and the operation image **340***b* corresponding to the operation image **340***c*. The operation image **340***b* has the same item elements as the item elements included in the operation image **340***c* and has the same item elements as the item elements included in the pop-up screen **240***b* (see FIG. **25**). The operation image **340***b* can be used to make selections as if making selections on the pop-up screen **240***b*.

When the operation images **320***b* and **340***c* are to be displayed as operation images on the mobile terminal **50**, the same detailed operations as those in the first to fourth embodiments can be performed.

When the operation image **340***c* is to be used, the following preparation operation (generation operation) may be performed at steps S**55** (see FIG. **13**), S**75** (see FIG. **21**), and the like.

In the preparation operation, information for generation as described in FIG. **28** is used. The information for generation includes various kinds of information (item IDs, item names, positions (X, Y), sizes (W and H), and others) related to a plurality of item elements to be included in the operation image **340** (in this example, optional item elements in the pop-up screen).

The mobile terminal **50** stores in advance in the storage unit **55** a model image (template image) **370** for a display image on the touch panel **77**. In response to the request for preparation described above, the mobile terminal **50** extracts the element IDs from the information for generation included in the request for preparation, and generates component images for the items based on the item names corresponding to the item IDs. For example, the mobile terminal **50** generates an component image **381** (see FIG. **29**) based on the item name "overall view" corresponding to the item ID "0001." Similarly, the mobile terminal **50** generates component images **382**, **383**, and others. The mobile terminal **50** then superimposes and arrange the component images on the template image **370** to generate the operation image **340***c* (see FIG. **29**). More specifically, a plurality of spaces for arrangement of item elements is provided horizontally in the template image **370**, and the mobile terminal **50** arranges the plurality of component images corresponding to the plurality of item elements (optional item elements) in the plurality of spaces for arrangement of item elements. Accordingly, the operation image **340***c* is generated with the plurality of component

images (item elements) arranged in the horizontal direction. In this example, the operation image **340***c* having the plurality of component images is generated without the use of the position information (X, Y) or size information (W and H) included in the information for generation. However, the present invention is not limited to this. The operation image **340***c* may be generated with the use of the position information (X, Y) or size information (W and H).

The operation image **340***c* may be generated by the MFP **10** by the same method or the like at steps S**16** (see FIG. **12**) and S**37** (see FIG. **20**).

In addition, the foregoing idea may be applied when a plurality of images including the display image **320***d* displayed on the touch panel **25** and a warning image (warning screen) **340***d* superimposed on the display screen and displayed in a pop-up manner is specified as operation images. Shortly, the warning image **340***d* may be specified as operation image **340** (second image). In this case, as the warning image **340***d*, character strings indicating a warning message (warning character strings such as "The cover is open. Close the cover.") may be displayed in the horizontal direction.

Each of the operation images **320** and **340** may indicate certain information and accept operation inputs from the user or may indicate certain information but not accept the operation inputs. For example, the operation image **320***b* (see FIG. **27**) may indicate the same contents as those on the preview display screen **220***b* for operations related to a preview image and may not accept operation inputs from the user. The warning image **340***d* may indicate a warning message but may not accept operation inputs from the user. These images may not be displayed on the touch panels **75** and **77** accepting operation inputs but may be displayed on a simple display unit merely displaying images but not accepting operation inputs. That is, the display units of the mobile terminal **50** may or may not accept operation inputs.

In the first embodiment and others, to the mobile terminal **50** the instruction for display indicating the decision on the display mode on the mobile terminal **50** at step S**13**. However, the present invention is not limited to this but the MFP **10** may transmit the instruction for display at another timing. For example, the MFP **10** may transmit to the mobile terminal **50** the decision together with the operation images **320** and **340** (or the request for preparation (the request for generation) of the operation image **340**).

In the foregoing embodiments, the two images **320** and **340** are mainly specified as operation images at step S**11**. When a single image is specified as operation image at step S**11**, it is decided that the single image is to be displayed on one display unit (the touch panel **75** or the like) of the mobile terminal **50**.

When three or more images are specified as operation images at step S**11** and the number of the display units of the mobile terminal **50** is recognized as three or more, it may be decided that the display target images are to be displayed on the individual display units. For example, when the three images **320***a*, **340***a*, and **340***d* are specified as operation images, it may be decided that the three images **320***a*, **340***a*, and **340***d* are to be individually displayed on the three display units of the mobile terminal **50**. In other words, it may be decided that the two images **320***a* and **340***a* are to be individually displayed on the two display units of the mobile terminal **50** and the other image **340***d* is to be displayed on the other display unit of the mobile terminal **50**.

Alternatively, even when three or more images are specified as operation images at step S**11** and the number of the display units of the mobile terminal **50** is recognized three or more, it may be decided that the display target images are to be displayed on only two display units (the first and second display units) without the use of the third display unit. For example, when the three images **320***a*, **340***a*, and **340***d* are specified as operation images, it may be decided that the two images **320***a* and **340***a* are to be individually displayed on the two display units of the mobile terminal **50** and the remaining warning image **340***d* is to be displayed on one of the two display units.

In the first embodiment and others, the MFP **10** acquires the information on the number of the display units of the mobile terminal **50** through communication. However, the present invention is not limited to this. For example, the MFP **10** may store in advance in the storage unit **5** the information on the number of the display units of the mobile terminal **50** so as to acquire the information on the number of the display units of the mobile terminal **50** by extracting the information from the storage unit **5**.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustrated and example only and is not to be taken by way of limitation, the scope of the present invention being interpreted by terms of the appended claims.

What is claimed is:

1. An image forming apparatus capable of being remotely operated by a mobile terminal, comprising:

a processor that includes:

a specification processing unit specifying an image to be displayed on the mobile terminal as an operation image for the image forming apparatus;

an acquisition processing unit acquiring information on the number of displays of the mobile terminal; and

a decision processing unit, when a plurality of images is specified as the operation images and the number of the displays of the mobile terminal is recognized as two or more, making a first decision that at least two of the plurality of images are to be displayed on at least two of the two or more displays of the mobile terminal, wherein the two or more displays are independent from each other and display different images; and

a transmitter transmitting a display instruction based on the first decision to the mobile terminal, wherein the display instruction describes that a relatively large first image out of the at least two images is to be displayed on a relatively large first display out of the at least two displays, and that a relatively small second image out of the at least two images is to be displayed on a relatively small second display out of the at least two displays;

wherein the processor further includes a determination processing unit determining whether the second image is to be prepared by the image forming apparatus or the mobile terminal based on the speed of network communication with the mobile terminal; and

wherein the determination processing unit determines that the second image is to be prepared by the image forming apparatus when the network communication speed is higher than a predetermined level, and the determination processing unit determines that the second image is to be prepared by the mobile terminal when the network communication speed is lower than the predetermined level.

2. The image forming apparatus according to claim **1**, wherein

the first image corresponds to an operation screen displayed on the operation unit of the image forming apparatus, and

the second image includes a plurality of hardware key images corresponding to a plurality of hardware keys provided in the operation unit of the image forming apparatus.

3. The image forming apparatus according to claim **2**, wherein the second image is generated by arranging the plurality of hardware key images in a predetermined direction.

4. The image forming apparatus according to claim **1**, wherein

the first image corresponds to a display screen displayed on the operation unit of the image forming apparatus, and

the second image relates to a pop-up screen superimposed and displayed on the display screen on the operation unit of the image forming apparatus.

5. The image forming apparatus according to claim **4**, wherein the second image is generated by arranging a plurality of item elements included in the pop-up screen in a predetermined direction.

6. The image forming apparatus according to claim **1**, wherein

when it is determined that the second image is to be prepared by the image forming apparatus, the transmitter transmits the at least two images prepared by the image forming apparatus to the mobile terminal, and

when it is determined that the second image is to be prepared by the mobile terminal, the transmitter transmits to the mobile terminal the first image and information for generation of the second image by the mobile terminal.

7. The image forming apparatus according to claim **1**, wherein the transmitter transmits to the mobile terminal the first image out of the at least two images and information for generation of the second image out of the at least two images by the mobile terminal.

8. The image forming apparatus according to claim **1**, wherein the transmitter transmits the at least two images prepared by the image forming apparatus to the mobile terminal.

9. The image forming apparatus according to claim **1**, wherein

when a plurality of images including the at least two images is specified as the operation images and the number of the display of the mobile terminal is recognized as one, the decision processing unit makes a second decision that a composite image of the at least two images is to be displayed on the single display of the mobile terminal, and

the transmitter transmits a display instruction based on the second decision to the mobile terminal.

10. A non-transitory recording medium storing a computer readable program for causing a computer built in a mobile terminal capable of operating remotely an image forming apparatus to execute the steps of:

a) receiving a display instruction describing that at least two images are to be individually displayed as operation images for the image forming apparatus on at least two of a plurality of displays of the mobile terminal;

b) displaying the at least two images as operation images for the image forming apparatus individually on at least two out of the plurality of displays according to the display instruction, wherein the two or more displays are independent from each other and display different images;

c) determining whether one of the at least two images is to be prepared by the image forming apparatus or the mobile terminal based on the speed of network communication between the mobile terminal and the image forming apparatus; and

d) when it is determined that the one image is to be prepared by the mobile terminal, generating the one image.

11. The non-transitory recording medium storing a computer readable program according to claim **10**, wherein

at the step c), it is determined that the one image is to be prepared by the image forming apparatus when the network communication speed is higher than a predetermined level, and it is determined that the one image is to be prepared by the mobile terminal when the network communication speed is lower than the predetermined level.

12. The non-transitory recording medium storing a computer readable program according to claim **10**, wherein

the step d) includes:

d-1) when it is determined that the one image is to be prepared by the mobile terminal, transmitting a request for transmission of information for generation of the one image;

d-2) receiving the information for generation from the image forming apparatus; and

d-3) generating an image in which a plurality of item elements included in the information for generation is arranged in a predetermined direction as the one image.

13. An image forming system having an image forming apparatus and a mobile terminal capable of operating remotely the image forming apparatus, comprising:

an image forming apparatus including a processor, the processor including:

a specification processing unit specifying an image to be displayed as an operation image for the image forming apparatus on a mobile terminal; and

a decision processing unit, when a plurality of images is specified as the operation images and the number of the displays of mobile terminal is recognized as two or more, making a first decision that at least two of the plurality of images are to be displayed on at least two of the two or more displays of the mobile terminal, wherein the two or more displays are independent from each other and display different images; and

the mobile terminal including a processor, the processor including:

a display control processing unit displaying the at least two images on the at least two displays of the mobile terminal;

wherein the processor of the image forming apparatus further includes an acquisition processing unit acquiring information on the number of the displays of the mobile terminal;

the image forming apparatus further includes a transmitter transmitting to the mobile terminal a display instruction corresponding to the first decision made by the decision processing unit based on the number of the images specified by the specification processing unit and the number of the displays specified by the acquisition processing unit;

the mobile terminal has a receiver receiving the display instruction from the image forming apparatus, and

the mobile terminal displays by the display control processing unit the at least two images individually on the at least two displays based on the received display instruction.

14. The image forming system according to claim 13, wherein

the image forming apparatus has a transmitter, when a plurality of operation images is specified by the specification processing unit, transmitting to the mobile terminal a notification that the number of display target images to be displayed as the operation images on the mobile terminal is plural, and

the mobile terminal has a receiver receiving from the image forming apparatus the notification that the number of the display target images is plural, and

the mobile terminal displays the plurality of images by the display control processing unit in response to the first decision made by the decision processing unit based on the notified number of the display target images and the number of the displays of the mobile terminal.

15. A non-transitory recording medium storing a computer readable program for causing a computer built in a mobile terminal capable of operating remotely an image forming apparatus to execute the steps of:

a) receiving from the image forming apparatus a notification that the number of display target images to be displayed on the mobile terminal as operation images for the image forming apparatus is plural;

b) when the notification that the number of the display target images is plural is received and the number of displays of the mobile terminal is two or more, making a first decision that at least two of the plurality of images are to be individually displayed on at least two of the two or more displays of the mobile terminal, wherein the two or more displays are independent from each other and display different images;

c) displaying the plurality of images according to the first decision;

d) determining whether one of the at least two images is to be prepared by the image forming apparatus or the mobile terminal based on the speed of network communication with the image forming apparatus; and

e) when it is determined that the one image is to be prepared by the mobile terminal, generating the one image.

16. The non-transitory recording medium storing a computer readable program according to claim 15, wherein

at the step d), it is determined that the one image is to be prepared by the image forming apparatus when the network communication speed is higher than a predetermined level, and it is determined that the one image is to be prepared by the mobile terminal when the network communication speed is lower than the predetermined level.

17. The non-transitory recording medium storing a computer readable program according to claim 15, wherein

the step e) includes:

e-1) when it is determined that the one image is to be prepared by the mobile terminal, transmitting to the image forming apparatus a request for transmission of information for generation of the one image;

e-2) receiving the information for generation from the image forming apparatus; and

e-3) generating an image in which a plurality of item elements included in the information for generation is arranged in a predetermined direction as the one image.

18. The non-transitory recording medium storing a computer readable program according to claim 17, wherein

the other of the at least two images corresponds to a display screen displayed on the operation unit of the image forming apparatus,

the one image relates to a pop-up screen superimposed and displayed on the display screen on the operation unit of the image forming apparatus, and

at step e-3), an image in which component images related to a plurality of item elements related to the pop-up screen is arranged in the determined direction is generated as the one image.

19. The non-transitory recording medium storing a computer readable program according to claim 17, wherein

the other of the at least two images corresponds to an operation screen displayed on the operation unit of the image forming apparatus,

the one image includes a plurality of hardware key images corresponding to a plurality of hardware keys in the operation unit of the image forming apparatus, and

at step e-3), an image in which the plurality of hardware key images is arranged in the determined direction is generated as the one image.

20. An image forming apparatus capable of being remotely operated by a mobile terminal, comprising:

a processor that includes a specification processing unit specifying an image to be displayed on the mobile terminal as an operation image for the image forming apparatus; and

a transmitter, when a plurality of images is specified as the operation images, transmitting to the mobile terminal a notification that the number of display target images to be displayed as the operation images on the mobile terminal is plural, so that the mobile terminal decides whether at least two of the operation images are to be individually displayed on at least two of the plurality of display of the mobile terminal, wherein the two or more displays are independent from each other and display different images;

wherein the processor further includes a determination processing unit determining whether one of the at least two images is to be prepared by the image forming apparatus or the mobile terminal based on the speed of network communication with the mobile terminal;

wherein the determination processing unit determines that the one image is to be prepared by the image forming apparatus when the network communication speed is higher than a predetermined level;

wherein the determination processing unit determines that the one image is to be prepared by the mobile terminal when the network communication speed is lower than the predetermined level; and

when it is determined that the one image is to be prepared by the image forming apparatus, the transmitter transmits the one image prepared by the image forming apparatus to the mobile terminal, and

when it is determined that the one image is to be prepared by the mobile terminal, the transmitter transmits to the mobile terminal information for generation of the one image by the mobile terminal and the other of the at least two images.

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